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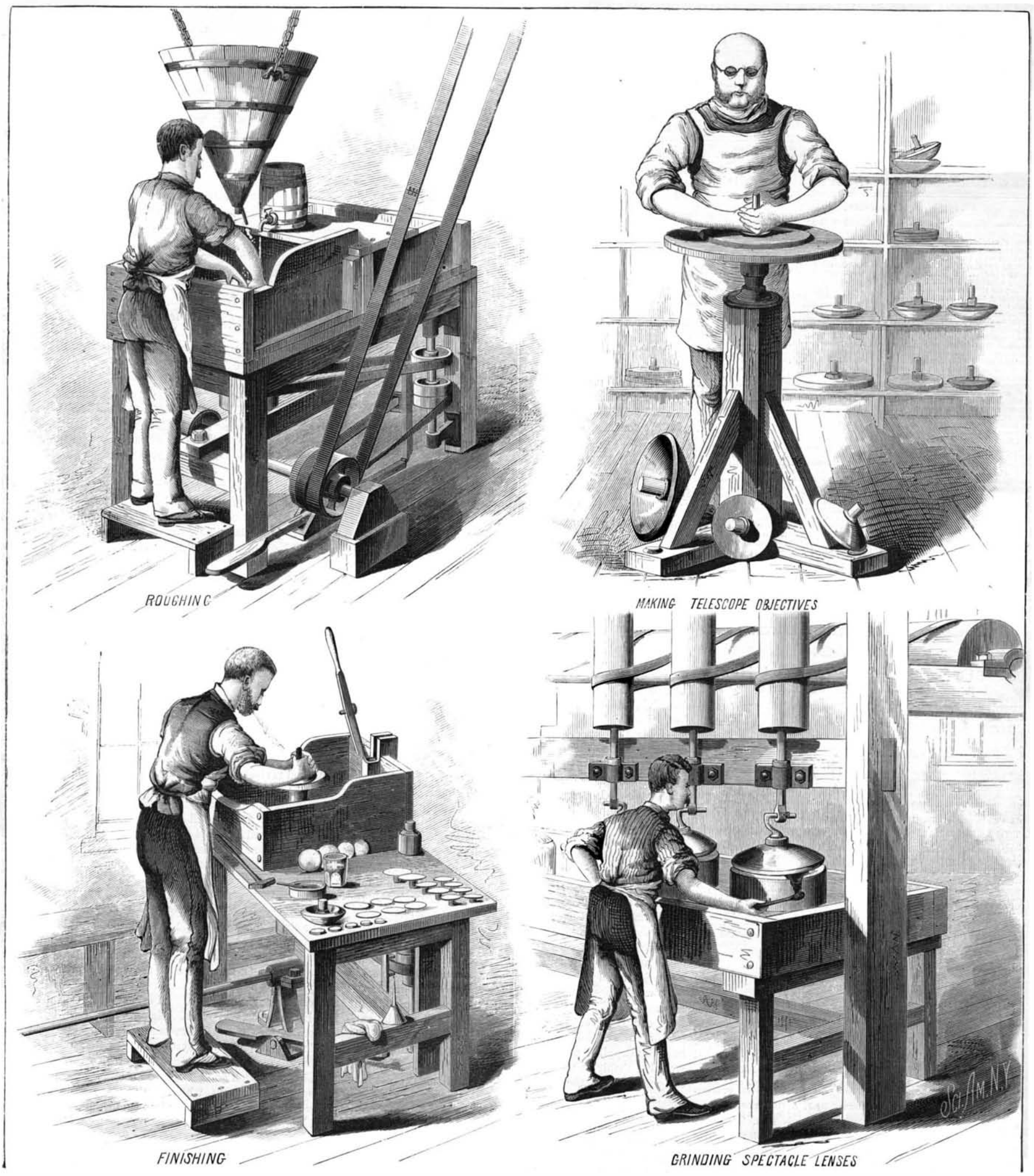
LENSES.

There is scarcely anything more admirable than a bright, well finished lens; to the art that produces these beautiful objects we are heavily indebted, for it has enabled us to peer into other worlds. It gives us the means of seeing objects so minute that without some visual aid their existence would be unknown. It has prolonged the usefulness of our failing eyesight, and has, in many other ways, contributed to our comfort and pleasure, and to the advancement of knowledge.

The process of making a lens is extremely simple, so much so, indeed, that a person observing the manipulations of an optician might conclude that almost any one could make a passable if not a perfect lens; but this is not so. It requires a great amount of practice, and a peculiar adaptability to fine mechanical work. The glass used for fine lenses is mostly imported from Europe. That used for achromatic lenses is made by the celebrated firm of Chance & Co., of Birmingham, England. It comes in pairs of disks, one of flint and one of crown glass. These disks are tested as to their refractive power, and

[*Continued on page* 162.]



THE MANUFACTURE OF LENSES.

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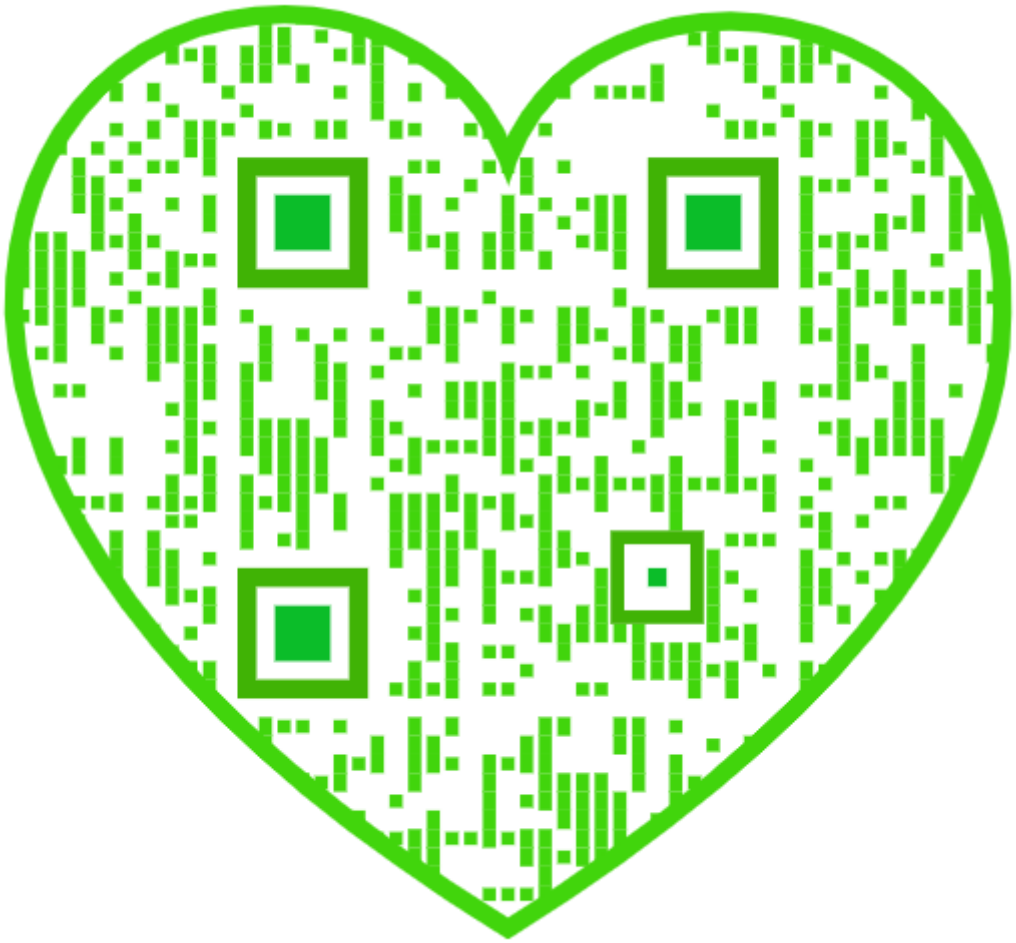

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NEW YORK, SATURDAY, SEPTEMBER 13, 1879.

Contents.

(Illustrated articles are marked with an asterisk.)

Alarm, electric [34]..... 172
American Science Association.. 161
American way, the..... 160
Assaying, books on [37].... 172
Batteries [33]..... 172
Battery solution [27]..... 172
Blowing up river snags..... 169
Boomerang, the..... 168
Brake, new..... 163
Carbolic acid, discovery in..... 169
Cement to resist kerosene [4].... 171
City horses..... 165
Clover seeds, how to save..... 170
Commissioner of Patents..... 161
Compressed air vessels [14]..... 171
Crabs of Cape Verde Island..... 165
Crooke's experiments [7]..... 171
Curing beef by injecting brine... 161
Electrical experiments..... 166
Electric bell circuit [19]..... 171
Electric lamp, new form of*..... 166
Entomological Club, the..... 168
Felspars, nepheline and leucite.. 167
Five legged frog, a*..... 165
Grape rot, the..... 167
Great Eastern, horse power of [24] 172
Hair, tonic for [32]..... 172
Huxley on pluck and endurance. 169
Industrial progress, recent..... 160
Insects, to kill [15]..... 171
Inventions..... 172
Inventions, agricultural..... 164
Inventions, engineering..... 163
Inventions, mechanical..... 164
Inventions, miscellaneous..... 168
Killing flies with gunpowder..... 164
Krupp of Essen..... 170
Lenses*..... 159
Lift locks and locking time..... 161
Machines, drying*..... 162
Marrow in bird's bones [16]..... 171
Hill, Sir Rowland..... 161
Meerschaum [34]..... 172
Melodiograph, the..... 166
Mississippi River commission.... 161
Music of the spheres, the..... 169
New books..... 171
Notes and queries..... 171
Oil well, volcanic..... 167
Objects of study, the..... 168
Our ferry traps..... 165
Panama ship railway, proposed.. 160
Photographing, rapid..... 161
Phosphorescence of the sea..... 166
Pneumatic cushions for elevators 170
Press, a new*..... 166
Revenue stamps, poisoned by.... 167
Rogers, Henry J..... 161
Russian fairs..... 170
Sand box tree, the..... 168
Sandpaper, to make [17]..... 171
Sea level changes..... 168
Shipbuilding, progress of..... 164
Siphon for mines [21]..... 171
Spider, red, on roses..... 161
Staining pine..... 170
Statistics, immigration..... 164
Steam rammer for paving..... 166
Steam heating in Troy..... 164
Steel armor plates, inefficiency of 169
Steel, to blue [12]..... 171
Springs [36]..... 172
Telephones, current in [20]..... 171
The human voice..... 167
Thermometer, a metallic*..... 163
Tobacco pipes in Germany..... 164
Tramway, self-laying*..... 163
Trade marks..... 172
Transmitting motion, device for* 166
Tomato plant, juice of..... 168
Vinegar, manufacture of [22]..... 171
Virginia's oyster trade..... 164
Volcano of Agua, ascent of the.. 170
Whale and the grampus*..... 167
Wheat raising in the South..... 170
Winding up a horse..... 165
Yellow fever, the..... 160

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 198,

For the Week ending September 13, 1879.

Price 10 cents. For sale by all newsdealers.

I. ENGINEERING AND MECHANICS.—The Bacchante. The fast unarmored screw corvette of the British Navy. 1 illustration.

A Large Steamer. The Orient. The largest merchant steamer afloat next to the Great Eastern.

New Steam Dredger. The twin screw hopper dredger, Neptune. Fig. 1—Side elevation.—Plan. Fig. 2—Cross section at engines.—Cross section at boilers.—Cross section at hopper.

American Engineering. IV. (Continued from SUPPLEMENT, No. 189.) Hydraulics.—Water as applied to commercial industries and domestic purposes.—American canals.—Water powers.—American water wheels.—Hydraulic engineering in California.—Water supply of American cities.—The Sandusky stand pipe.—American pumping engines.—Pumping engine at Lawrence, Mass.—Pumping engine of St. Louis water works.—Worthington's duplex pumping engines.—Holyoke dam and canal.—Dam across the Mohawk at Cohoes, N. Y.

II. THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—Saratoga Meeting, August, 1879.

History and Methods of Paleontological Discovery. By Prof. O. C. MARSH. The first period.—Zenophanes.—Aristotle.—Theophrastus.—Anaximander.—Pliny.—Tertullian. Second Period.—Leonardo da Vinci.—Conrad Gesner.—George Agricola.—Andrew Mallioli.—Pallissy.—Early English students of fossils.—German catalogues of the 17th century.—The Deluge hypothesis.—Voltaire.—Buffon.—Woodward.—Werner.—Linnæus.—New Era, and the beginning of a methodic study of fossils.—Cuvier, Lamarck, and William Smith.

Philosophy of the Pupation of Butterflies. By Prof. C. V. RILEY. 3 figures.

Experimental Determination of the Velocity of Light. By ALBERT A. MICHELSON, Master, U. S. Navy. 12 figures. An elaborated presentation of the method and apparatus employed at Annapolis.—Method of calculating the velocity of light, and results obtained.

Mythologic Philosophy. Vice-Presidential address of Prof. J. W. POWELL. Section B. I. The genesis of philosophy.—II. Two grand stages of philosophy.—Wind.—Sun and Moon.—Rain.—Rainbow.—Falling Stars.—Migration of Birds.—Diversity of Languages.—Evolution of gods.—Outgrowths from mythologic philosophy.

III. ROYAL ASTRONOMICAL SOCIETY.—Oxygen in the Sun. Paper by DR. HENRY DRAPER. Method of discovery. Discussions.—Mr. Raynard, Mr. Christie, Mr. Proctor, Dr. Gladstone, Dr. Huggins.

IV. MEDICINE AND HYGIENE.—Notes of Hospital and Private Practice in San Francisco. By H. GIBBONS, Sr., M.D. Consumption. Cough and night sweats. Food and drink for consumptives. Malarial diseases. Intermittent typhoid fever. Rheumatism and neuralgia. Disease of the heart. Jaundice.

Aural Therapeutics. Clinical lecture by LAWRENCE TURNBULL, M.D. Frequency of aural diseases. Preponderance of chronic affections. Action of aconite. Digitalis. Bromides. Chloral hydrate. Exhibition of cases.

Appearance of the Tongue in Disease. By J. A. HENNING, M.D.

Strychnia Poisoning Treated with Chloral Hydrate, Apomorphia, and Electricity.—Recovery. By C. WORTHINGTON, M.D.

V. TECHNOLOGY AND CHEMISTRY.—Preparing Gelatine Emulsion by Photo-Chemicos. A simple and economical process.

The Gelatine Bromide Process. By A. J. JARMAN. 3 figs.

VI. MISCELLANEOUS.—Prediction of the Weather. By Professor KLINKERFUSS.

The Microphone Telephone. 2 figures.

Are Birds Derived from Dinosaurs? By Professor B. F. MUDGE. A suggestive review of the evidence against the evolution of birds from dinosaurs.

THE AMERICAN WAY.

One of the secrets of the variety and success of American manufactures is the readiness with which the manufacturers receive suggestions from their customers. If a buyer from a distance says that an article would better meet the wants of his locality if certain alterations were made, the American maker hastens to supply him with the thing he wants. Not unfrequently he will send a competent man to study the conditions of the distant region, that the required adaptation may be more certain and efficient, or an entirely new contrivance invented to supply the need.

In English and other European shops the man who wants something new constructed, or an alteration made in some standard article, is very apt to be snubbed. They have no time to waste on such experiments; and even if the new device should prove a slight improvement, they think it wouldn't pay to alter patterns and machinery to make it.

The result is, American manufacturers are not only monopolizing the home trade by the superior quality and fitness of their products to meet home wants, but by the same tactics they are gaining a permanent footing in foreign markets.

A characteristic illustration is furnished by a correspondent of the London *Times*, writing from Sydney, New South Wales. He says:

"It is a great thing to get control of the market, and the first thing is to get a good footing, and the Americans are certainly pushing for that with an energy which at least deserves success. Our railway department is putting together three large new locomotives from Philadelphia. Their design is the result of close personal observation of our precise wants by one of the partners in the firm of Baldwin & Co. I am not prepared to say whether these engines will prove in every respect better than those which we get from England, but I do not remember any English firm taking the same pains to study what we want to deal most successfully with—the steep gradients and sharp curves of our railway on the Blue Mountains. Perhaps it is not worth the while of the English makers to attend to such petty details, but the Americans think differently."

And, we may add, American manufacturers do not consider such details "petty." Tools and machinery are somewhat like animals and plants, in needing to be thoroughly adapted to their environment. The difference between an organism which thrives in England but will not in Australia, and one of the same genus which will thrive in Australia, may be inappreciable to the unskilled observer; but it is vital, and outweighs all the points of resemblance. So a machine, perfect from the standpoint of England or America, might fail utterly to meet the different needs of another region, though the alteration required to adapt it to the new conditions might be comparatively slight and easily perceived by an expert on the spot.

THE PROPOSED PANAMA SHIP-RAILWAY.

The St. Louis *Exporter and Importer* has taken pains to get from several engineers of high standing an opinion as to the feasibility of the ship-railway project for the Isthmus of Darien, set forth in the communication of Captain Eads already placed before the readers of this paper.

Chief Engineer Chanute, of the Erie road, writes that he had already given considerable attention to the scheme, arriving at conclusions almost identical with those of Captain Eads as to its feasibility and general features. He would, however, double the number of wheels proposed for each cradle, so as to give an average load of five tons to each wheel, sustaining the cradle, ship, and machinery (say 10,000 tons in all) on 500 trucks of 4 wheels each. To carry these wheels he proposes eight parallel tracks, 13 feet between centers, or 96 feet over all; the cradle to be 500 feet long, 50 feet high, and 44 feet wide, with a total base of about 110 feet. Instead of the 500 foot turntables suggested by Captain Eads, Mr Chanute would make the turntable a part of the cradle by giving the trucks a transversing motion, at right angles to the axis of the cradle, sufficient to enable them to assume the proper position on the chord subtending the curves adopted, for a length equal to that of the cradle. Grades of one per cent would have to be adopted, and with a railway 60 miles long a steamer could be transferred from ocean to ocean in 12 hours by the employment of about 8,000 horse power. The cost of working should not be over one fourth of a cent a ton a mile, the weight of the vessel and cradle being included, or three fourths of a cent a ton a mile on its contents. Even at half the traffic estimated by the canal commission the road would pay handsomely.

Mr. C. Shaler Smith thought the only question in doubt was one of finance. Though a grand undertaking it would be by no means a difficult one, and the estimate of Captain Eads, $50,000,000, would fully cover the outlay. The enterprise would most undoubtedly pay. The tidal variation at Panama—20 to 25 feet—would make the handling of shipping there comparatively easy. At Aspinwall, with a tidal variation of about 18 inches, the entire lift would have to be made by supplied power. A caisson on an inclined plane would probably be the best form of lifting dock. He would hang the ship in the cradle in flexible slings composed of woven bands of steel wire rope, 5 feet wide and 1 inch thick. These slings would be connected with the cross heads of a number of hydrostatic presses placed along the cradle and connected by a pipe common to all, so that the ship would be always carried on an even keel, the same as though floating in a caisson. Ten parallel tracks, of 3 feet gauge, rails not less than 6 inches high, and tracks 10 feet apart, would be needed. This would give a total wheel base of 93 feet by, say, 460 feet for the largest cradle. Assuming a maximum load of 9,500 tons, 432 trucks, or 1,728 wheels, would be needed—a result substantially in accordance with that arrived at by Mr. Chanute.

As a method of supplying power for the transportation of the cradle, Mr. Smith suggests the Belgium wire rope towage system. If possible, level grades should be carried up to the base of the summit hills, and then by concentrating all the grades at one point the cradles could be moved over the summit by powerful stationary engines. If the summit can be passed, however, with a maximum grade of 20 feet per mile, then movable engines, drawing the cradles and themselves by steel wire towlines, laid in the middle of each track, and passing over and grasped by "Fowler clip pulleys" attached to each engine, will be the most economical method of locomotion in all probability. The power needed to transport the greatest load, with curves of 12,000 feet radius and grades of 20 feet per mile, would be 200,000 pounds, requiring steel ropes of 1½ inch diameter each. However, as these would form a costly part of the outfit, the relative economy between this system and that of the locomotive engine, for this peculiar service, can only be determined by exact calculations.

Mr. Henry Flad, C.E., writes that he has taken pains to inform himself in regard to the surveys and estimates for ship canals across the Isthmus, and has carefully estimated the cost of construction, maintenance, and operation of a ship railroad. Briefly stated, his opinion is as follows:

1. That the first cost of the construction of a ship railroad will not be one fourth of that of a ship canal.

2. That a ship railroad can be constructed in probably one third of the time required to construct a ship canal.

3. That ships can be transferred on such a railroad with absolute safety, and with the same dispatch as through a ship canal.

4. That the cost of maintenance will be less for the railroad than for the canal.

5. That although the cost of transferring ships by ship railroad will exceed that of passing them through a ship canal, the difference will be insignificant compared with the saving of interest on the first cost.

6. That the ship railroad will therefore offer a better and safer investment for capital.

The unanimity of these experienced and able engineers with regard to the feasibility and economy of a ship railway for the Isthmus is, to say the least, noteworthy and encouraging. Like all grand undertakings it presents an almost inexhaustible field for engineering skill and inventive talent; and it is gratifying to see that American engineers are so prompt to grapple with the novel difficulties presented.

RECENT INDUSTRIAL PROGRESS.

Speaking of the revival of industry that has taken place since preparations for the resumption of specie payment were begun in the spring of 1877, Secretary Sherman said, in a recent speech:

In the production and manufacture of cotton the progress during the past four years has been unexampled, showing an increase of 30 per cent. The increase in the number of bales taken within the last two years over the two preceding years is 417,517, or more than 14 per cent. The present cotton year, ending in September, will show a more rapid rate of increase. The number of spindles has increased from 7,114,000 in 1870, to about 10,500,000 in 1878, an increase of over 47 per cent. The woolen manufacturing industry has recently received a strong impetus, which in a few weeks sent up the price of wool 20 per cent, and greatly encouraged the business of wool growing, and started many of the woolen manufactories that had been lying idle. The production of breadstuffs and meats has been enormously increased within the last year or two, and a ready market has been found for the surplus production. The net increase in pork packing is 38 per cent. The increase in beef production has been constant and progressive, stimulated by prices that have scarcely declined during the past two years. There has been a marked revival in the iron trade during the last two years. In 1873 the production of pig iron in this country reached its maximum, amounting to 2,868,278 tons. Under the influence of the panic it fell off to 2,093,236 tons in 1876. In 1877 it increased to 2,314,585 tons, and in 1878 to 2,577,361 tons. This year, it is believed, the production of iron will be as great as that of the most prosperous year in the history of this product.

The Yellow Fever.

The steady progress of the epidemic in Memphis has been less startling than last year, but for all that, sure and fatal. From 20 to 30 new cases daily, in a town so depopulated as Memphis now is, and where of those that remain so many are protected by previous attacks, is indicative of a potent and concentrated infection. Of other towns, Corinth, Miss., has had one or two cases. Mayersville, Miss., is also reported as suffering. It has been very properly decided to continue perfecting the system of isolation of Memphis, under the rules of the National Board of Health, which have already given such good results, to use every possible means to induce the negroes, who constitute the main source of danger in Memphis, to move into camps, and thus deprive the fever of material to work on; to secure the isolation of cases and affected houses, blocks, and districts, and to effect this by combining as far as possible the resources of local, State, and national boards with those of the Howard Association and of the taxing district and county authorities, and thus limit the spread of the disease.

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Dr. W. L. Coleman, of San Antonio, Texas, who was ordered by the National Board of Health to investigate the origin of the yellow fever prevailing in Memphis, has been at work for a month past, and his investigations convince him that the germs were imported direct from the West Indies, and that they passed the New Orleans quarantine unchallenged, and arrived in Memphis some time in June.

THE COMMISSIONER OF PATENTS IN A DILEMMA.

It will be remembered that in 1877 the roof of the Patent Office building was destroyed by fire, and a great number of models were burnt and broken. Since then a great deal of discussion has arisen as to what improvements should be included in the repairs, and considerable time consumed in getting the necessary appropriation allowed by Congress before the work could proceed. But finally a plan was decided upon and an appropriation granted, and the work has progressed quite rapidly during the summer.

The iron work for the support of the roof and the new gallery is already nearly completed and in place, and the whole building is expected to be roofed in by the middle of October. But owing to the breaking up of the old roof to allow the ironwork to be placed in position, considerable inconvenience has been experienced from the rain. A correspondent of the Philadelphia *Bulletin* relates the observation of a gentleman who had business with the Commissioner of Patents, and called upon that official during one of the days of the late severe rainstorm, and found him sitting in a corner of his office, having moved his desk away from the usual place in the center of the room, in order to escape the rain which was trickling down through the roof and the floors above. A colored messenger, having collected all the available spittoons, was engaged in moving them about from place to place in the Commissioner's room wherever he saw signs of a new leak, in order to protect the carpet from the rain. Several of the adjoining rooms occupied by the Deputy Commissioner and clerks of the Patent Office and a portion of the hall of the main floor were in a still worse plight. Beyond the temporary inconvenience of the officials no damage was done, as the records and files of the Patent Office were kept in better sheltered quarters.

THE RED SPIDER ON ROSES.

H. M. Hill, Clancey, Montana, sends us specimens of his roses, the leaves of which are seared and yellow, and asks the cause and cure.

A careful examination shows that the plants have suffered from what is commonly known as the red spider (*Tetranychus telarius*). It is a true mite and not a spider, though belonging to the same subclass.

Among the mites we find many species, some beneficial to man, others noxious. In a list of the former we may mention the locust mite (*Trombidium locustarium*, Riley), which preys upon both the locust and its eggs. It is an important auxiliary in checking the multiplication of the Rocky Mountain locust. Another species (*Uropoda Americana*, Riley) preys upon the Colorado potato beetle; while still another (*Trombidium muscarum*, Riley) infests, in the larva state, the common house fly.

Among the noxious species are the itch mite, the cheese mite, the jigger or harvest mite of the more Southern States (*Leptus Americanus*, Riley), and the one at present under consideration, the red spider.

A curious fact in the life history of these tiny creatures is that they are born with but six legs, though in the adult state they have eight.

The red spider, which is such a pest to the florist, thoroughly dislikes water. It cannot thrive in a humid atmosphere nor on plants often drenched with water. On the other hand it multiplies rapidly in a dry air, so that some florists consider it a certain evidence that their plants are not receiving sufficient water when the spider appears.

Drench the leaves of infested plants often with water in which is a little whale oil soap. See that every leaf is thoroughly moistened, and repeat the sprinkling frequently according as the weather is hot and dry, and the pest will soon disappear. It is bad on vines and shade trees only in the hot, dry weather of midsummer, and needs most watching then.

RAPID PHOTOGRAPHING.

Mr. Muybridge's method of photographing horses in rapid motion has lately been applied in San Francisco to the study of human action, particularly that of athletes while performing their various feats. In order to display as completely as possible the movements of the actor's muscles, they wore brief trunks only while performing, and thus all the intricate movements of boxing, wrestling, fencing, jumping, and tumbling were instantaneously and exactly pictured.

The first experiment was in photographing an athlete while turning a back somersault. He stood in front of the camera motionless, and at a signal sprang in the air, turned backward, and in a second was again in his original position, and in his very tracks. Short as was the time consumed in making the turn, fourteen negatives were clearly taken, showing him in as many different positions.

The same man was also taken while making a running high jump. The jumping gauge was placed at the four foot notch, in order to give an easy jump, as in making it fourteen stout hempen strings had to be broken, as in photographing trotting horses. From the camera to a point beyond the line on which the jump was made, a number of strings were stretched. The two base lines were only a few inches above the ground, and from them to the apex the strings were placed an equal distance apart. In jumping, seven of the strings were broken in ascending and seven in descending. The strings were tautly drawn, and so connected with the camera that as each one parted a negative was produced.

Other pictures were taken of men raising heavy dumbbells, and the various movements of boxing, fencing, and the like.

CURING BEEF BY INJECTING BRINE.

The infiltration system of salting beef, by filling the bloodvessels with brine, is attracting considerable attention in Australia. In some recent experiments at Brisbane, bullocks were treated as follows: At the instant of killing the animal's heart was laid bare, and incisions were made in both ventricles. Into the orifice of the left ventricle a pipe was inserted, and a stream of weak brine was forced through the bloodvessels, washing out all the blood. Pressure was obtained by having the brine in an elevated tank. After the expulsion of the blood the right ventricle was closed by a clamp, and stronger brine was forced in until all the bloodvessels were full. In this way the distribution of the brine through every part of the meat is said to be complete and the curing perfect. It is proposed to send to the Sydney Exhibition a whole bullock thus preserved.

LIFT LOCKS AND LOCKING-TIME.

At the Paris Canal Congress one of the chief objections urged against a ship canal with locks was the alleged great delay incident to locking. It was said that from one to two hours would be consumed in entering a ship, closing the gates, filling the lock, opening the gates, and leaving. The eminent English engineer, Sir John Hawkshaw, said that fifteen minutes would suffice for all these operations. Admiral Ammen says that this estimate is still further reduced by General Weitzel, U. S. Engineer, to eleven minutes. General Weitzel has for many years been engaged in building and operating locks, and in July next will have completed, at Sault Sainte Marie, Michigan, the largest lift lock on the globe. Its dimensions are: Length, 515 feet; breadth, 80 feet; lift, 18 feet; gates to admit vessels of 60 feet beam.

The Mississippi River Commission.

The first session of the Mississippi River Improvement Commission was held in Washington, August 20. A committee was appointed, composed of General Harrison, of Indianapolis; Professor Mitchell, of the United States Coast Survey, and Major Suter, of the Engineer Corps, to submit recommendations as to the best method of obtaining and compiling statistics of the trade, commerce, etc., of the Mississippi Valley, and such other data as may be required for the use of the commission. Another committee was appointed, consisting of General Comstock, of the Engineer Corps; Professor Mitchell, of the Coast Survey; Major Suter, of the Engineer Corps; and Major Harrod, of New Orleans, to prepare a plan for the future work of the commission, and to make such recommendations as they deem necessary with regard to the use and expenditure of the existing appropriation of $175,000.

St. Louis has been selected as the permanent headquarters of the commission, and the office there will be under the immediate charge of the permanent secretary, who will be the executive officer of the commission, and act under the direction of a committee to be selected from among the members who reside in the West.

Sir Rowland Hill.

Sir Rowland Hill, to whom the world is so largely indebted for cheap postage, died at his home in Hampstead, England, August 27, at the age of eighty-four years. Sir Rowland was born in Yorkshire, December 3, 1795. His first occupation was as mathematical tutor in a school near Birmingham. As secretary of the South Australian Commission, he aided, in 1835, the founding of the colony of South Australia. It was about this time that he first turned his attention to the defects in postal organization, and in 1837 he published a pamphlet on the much needed postal reform. His exertions resulted, in 1838, in the appointment of a special committee of the House of Commons, and in August of the same year the commission reported in favor of adopting the plan of a uniform low rate of postage, as recommended by Mr. Hill, the evidence having proved that injurious effects resulted from the old state of affairs to the commerce and industry of the country, and to the social habits and moral condition of the people. In 1839 more than two thousand petitions were presented to Parliament in favor of the scheme, and in 1840 it was carried out.

The labors of Mr. Hill in putting the scheme into execution were protracted and severe. For many years he held the office of Secretary to the Postmaster General. He was knighted in 1860, and retired from office in 1864, on account of failing health.

Henry J. Rogers.

Henry J. Rogers, who assisted in the erection of the first telegraph line between Baltimore and Washington, died at his residence in Baltimore, August 20, aged sixty-nine years. He was subsequently superintendent of the North American Telegraph Company, and was the author of the code of marine signals now in use at all the ports of the country.

THE AMERICAN SCIENCE ASSOCIATION.

The annual session of the American Association for the Advancement of Science began, August 27, at Saratoga, New York, with an unusually full attendance of members. Considerable preliminary business was transacted, but no papers were read.

The address of President Barker was the principal feature of the morning session. In the course of his remarks, the object of the association was declared to be the advancement of science not only by the discovery of new truth, but also by the diffusion of that already known. To this end it extends a cordial recognition to all organizations of what ever sort whose objects are akin to its own. Being itself national in character—for science knows no country and no section of country—it gives its indorsement to all local enterprises, and stands ready to assist them in any legitimate way. Whether it be a State, geological, or topographical survey, an academy of science, or association or individual seeking to unravel nature's secrets, the association desires to strengthen their bonds and to uphold them in the communities where they are located. Its province is to awaken an interest in pure science; or, where such interest already exists, to develop it to the full. It invites all interested in science to its membership, and opens its sessions to all comers. That its periodical and migratory meetings, in the words of the constitution, have actually done what they were intended to do, have promoted intercourse between those who are cultivating science in different parts of America, have given a stronger and more general impulse and a more systematic direction to scientific research, and have procured for the labors of scientific men increased facilities and a wider usefulness, no one who has watched its history can doubt.

Less perfect acceptance, we fancy, will be accorded Mr. Barker's subsequent remarks, in which he excludes inventors from the ranks of original investigators and discoverers. It is true that in very many instances the discoverer has not been an inventor, and that discovery has usually been the real mother of invention; true, also, that original research is the storehouse out of which comes invention. But it will not do to assume, as Mr. Barker appears to, that discoveries are made only or generally by men who "patiently investigate truth for its own sake," and "deny" themselves "the good things of this life to obtain it." There is rising up among us a generation of inventors, who are also explorers and discoverers of the most energetic and successful type; and they push the work of investigation and invention with no intention of denying themselves the good things of life. Their inventions pay; but their discoveries are none the less scientific and honorable.

On the second day the proceedings of the association assumed their regular scientific character. A number of interesting papers were read and discussed, and in the evening the retiring president, Prof. O. C. Marsh, delivered the customary address, reviewing the "History and Methods of Palæontological Discovery." It will be found in full, commencing in the current issue of THE SCIENTIFIC AMERICAN SUPPLEMENT.

In Section A, the address of Prof. Ira Remsen, Chairman of the Sub-Section of Chemistry, was read, in the absence of the author. It was devoted to the chemistry of the organic compounds, a department sadly neglected in American colleges. This paper was followed by one on the "Experimental Determination of the Velocity of Light," by Albert A. Michelson, U.S.N., specially describing and illustrating the experiments lately conducted at the Naval Academy at Annapolis. This valuable paper also appears in full, with numerous illustrations, in this week's SUPPLEMENT. The result obtained—186,305 miles a second, with a probable error of 3 miles—falls nearly midway between those of Foucault and Cornu. Prof. Newcomb, who has been conducting a series of similar investigations, expressed the belief that Mr. Michelson's results are probably within $\frac{1}{500}$ of correctness.

In Section B, the first paper was by Prof. Warren Upham, of the Geological Survey of New Hampshire, on the "Succession of Glacial Deposits in New England." It was read by Prof. C. H. Hitchcock, and discussed by Profs. Martin, Lislie, Gardner, S. H. Cook, W. H. Niles, Worthen, and Hall. The conflict of opinion showed how far the subject is from being thoroughly and satisfactorily worked out.

The second paper was by Prof. J. M. Safford, of Nashville, on "The Thinning Out and Absence of Upper Silurian and Devonian Formations in Tennessee."

It was followed by a discussion, after which the recently discovered copper veins at Blue Hill, Me., were described by Professor C. H. Hitchcock, of Dartmouth College, who exhibited specimens of ore containing 34 per cent of copper. Evidences of silver and even of some gold have been discovered, and probably the silver will be ultimately worked with success. Major Powell spoke of the work done on the eastern flanks of the Rocky Mountains and on the eastern side of the Sierra Nevada.

Among the remaining papers of the day, that by Dr. Clarence J. Blake, on the "Consonantal Expression of Emotion," was the most interesting. A number of linguists and ethnologists took part in the discussion which followed, bringing out many curious and amusing peculiarities in the pronunciation of foreign, cultivated, and savage languages.

A PNEUMATIC DISPATCH TUBE.—Shavings from a planing mill in Chicago are, by an air-blast, blown 700 feet, through a 15 inch sheet iron pipe, to a distillery, where they are burned for fuel.

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LENSES.

[*Continued from first page.*]

classed according to the use to which they are applied. The flint glass for telescope objectives is more dense than that used for the achromatic lenses of photographic cameras.

The disks are cut to the required size, either by means of a diamond or by a revolving iron hoop supplied with sharp sand and water; they are then roughened into shape in the machine shown in one of the upper views in the large engraving on our front page. The hopper suspended from the ceiling contains sharp sand and water, which are allowed to flow out upon the form or tool on the upper end of the vertical spindle. This form, or tool as it is called, has the same curvature as the lens to be made. It is convex for a concave lens, and concave for a convex lens. A disk of glass held upon this tool, charged with wet sharp sand and water, soon assumes the desired curvature, and is ready for the next step, which consists in grinding the lens in another machine with three different grades of emery on as many different tools.

The emery ranges from No. 90 to No. 150, the last grade leaving a surface sufficiently fine to be at once polished with rouge. To the back of each disk of glass a hub is cemented with pitch. In the center of this hub there is a conical hole of sufficient depth and size to receive the point that projects from the lever by which the disk is held down upon the finishing tool. When small lenses are ground, an ordinary handle, having a steel point, is used, instead of the lever, as shown in the lower left hand view. When lenses are ground in this way the tool is much larger in diameter than the disk, and the latter is held eccentrically in relation to the axial line of the tool, so that as the tool revolves the disk is also made to revolve, thus continually changing the relation of the surfaces in contact, thereby insuring greater accuracy in the form of the lens.

Between the applications of the several grades of emery the disk is thoroughly washed, and great care is exercised to prevent any particles of the coarser emery from becoming mixed with the finer.

After the application of the finest grade of emery the glass disk and the tool are both thoroughly washed, and the face of the tool is covered with fine woolen cloth similar to broadcloth, which is made to adhere by a thin coating of melted pitch applied to the face of the tool before putting on the cloth. The tool thus prepared is wet by blowing on water from the mouth in a thin spray as represented in the engraving, and the workman applies to the cloth surface a ball of fine rouge, forming on the face of the cloth a thick paste of rouge and water. The lens, if large, is held upon the tool with the lever in the same manner as in grinding. If small, it is held by the steel-pointed handle. A gentle pressure is applied, and, should the tool become too dry before the required polish is secured, water is blown over it with the mouth, as before described. After having finished one side of the lens the other is proceeded with in precisely the same way. The treatment is the same for both convex and concave lenses. In grinding the best quality of telescopic objectives the operation is wholly performed by hand. This is done in the manner shown in the upper right hand figure of the engraving. The tool is supported by the post, and the disk is moved in a series of small circles, and at the same time turned as the operator moves slowly around the post. In the case of telescope lenses, the final finish is secured by a pitch surface formed on the tool, and traversed by grooves running across it in different directions.

Very small lenses are formed from pieces of glass cemented to the end of a stick. The roughing is done upon a common grindstone. The grinding is done in much the same way as already described; the polishing, however, is somewhat different; the tool being covered with a mixture of rouge and beeswax, the amount of rouge being sufficient to render the beeswax quite hard. The form is given to the wax surface by pressing the unpolished lens into it. A thin paste of rouge and water is applied to the tool occasionally.

Ordinary spectacle lenses are ground in quantities in the manner represented in the lower left hand view in the front page engraving. Here a great number of pieces of glass are cemented to a form with pitch, and the tool is moved over it by a short crank on the lower end of the vertical spindle. The workman dashes emery and water or rouge and water over the form; and the upper tool, in addition to receiving an oscillatory movement, is slowly rotated by the action of the crank in the socket at the back of the tool. Generally a series of forms are operated in a single bench and attended by one man. The steps in the operation of grinding spectacle lenses are about the same as when single lenses are ground. After they are ground and polished upon one side they are removed from the form and turned over, cemented to the form, and ground and polished upon the other side.

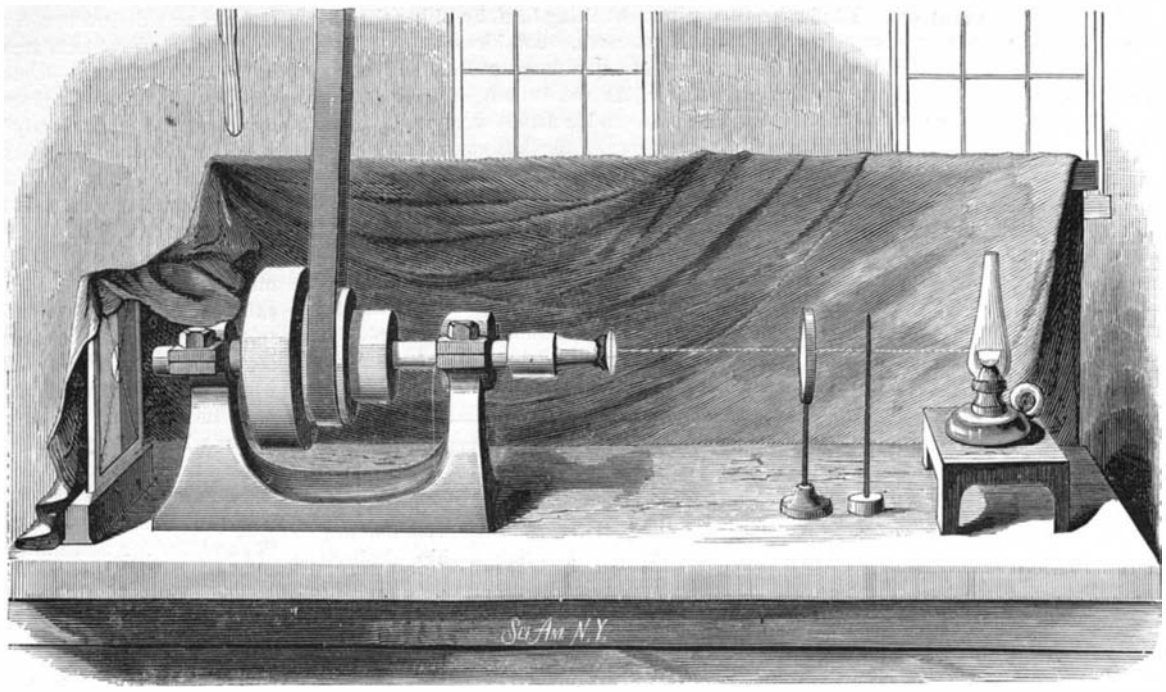


Fig. 2.—CENTERING LENSES.

For many purposes it makes little or no difference whether the axis of a lens corresponds with its geometrical center, but for telescopes, opera glasses, photographic cameras, and other instruments of accuracy, their optical and geometrical centers must correspond. The manner of testing lenses to ascertain if the optical center and the geometrical center coincide, is illustrated in Fig. 2. The lens is cemented to a chuck upon one end of a hollow lathe mandrel; near the opposite end there is a ground glass surface, and in front of the lens being tested there is another lens supported on a standard, beyond which there is a small vertical rod and a lamp. These different pieces are all in line with the axial line of the mandrel, and an image of the rod is cast upon the ground glass screen. If the image remains stationary while the lathe revolves, the optical center of the lens coincides with the center of rotation, but if the image moves, the optical center is out, and the lens must be centered while the cement which supports it is still warm and soft. This is easily done by holding the hands against the edge and sides of the lens as it revolves. When the lens is optically centered, if its periphery is out it must be ground down. This is readily done by placing under it a piece of sheet iron bent into semicircular shape, and forced upward against the edge of the lens by means of a screw passing through a board that supports it. The sheet iron is charged with sand or emery and water, and as the lathe revolves the lens rapidly assumes a circular form.

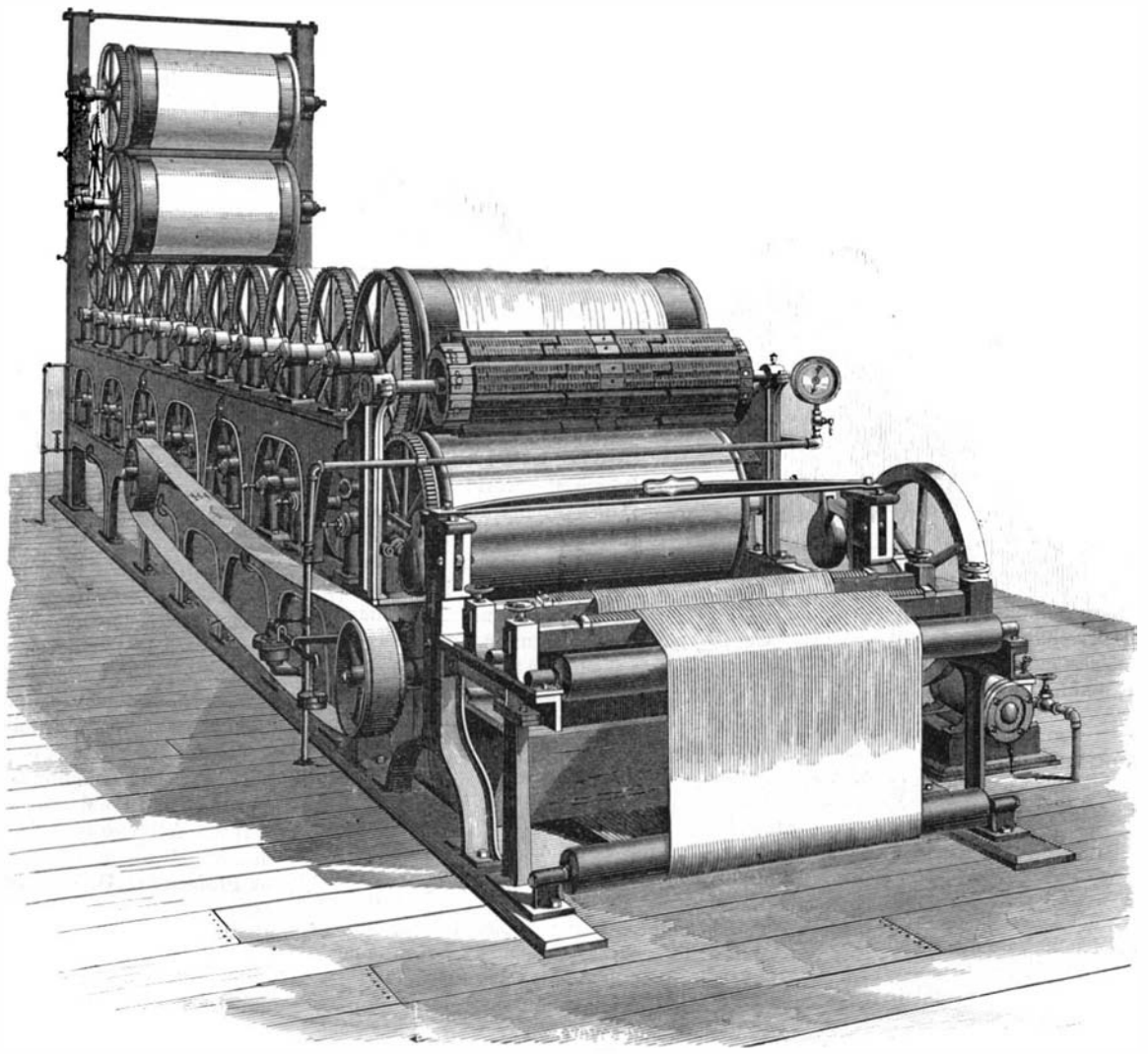
The matter of testing the different qualities of glass used in the manufacture of fine achromatic lenses has been omitted on account of the abstruseness of the subject and the amount of space required to properly treat it.

For many of the points given above we are indebted to Mr. Chas. F. Usner, a practical optician of this city, from whose factory, at 128 and 130 Fulton street, we have taken the majority of our sketches.

DRYING MACHINES.

The lower engraving on this page represents one of Messrs. H. W. Butterworth & Sons' drying machines, such as are used for printworks, bleacheries, and for drying cotton warps and finishing tickings, osnaburgs, etc. This machine is arranged with twenty-four cylinders, supported by a framing, eighteen of them being on a horizontal and six on a vertical frame. The grouping of these cylinders in a horizontal, vertical, or other direction may be modified to suit special requirements; and where the floor space is contracted, the vertical arrangement is preferred.

The frames of the machine are made of cast iron, being quite heavy in their construction, with broad planed surfaces; and hollow passages are cast in them for the transmission of the steam used in heating the cylinders and the return of the condensation, thus dispensing with outside pipes and connections. The steam passes into each cylinder and leaves it again by means of branch passages cast on to the frames and connecting with journals in which the axes of the cylinders run. The stuffing boxes for the journals are packed from the front by an arrangement introduced by this firm in 1867, this packing, however, forming no part of the bearing. The advantages derived from this method consist in the easy access given to the packing, which also lasts longer than in the ordinary arrangement; in an allowance of greater freedom for expansion of the cylinders than can be attained in any other way, and in furnishing an abundant length of bearing for the axles. This firm formerly packed the stuffing



H. W. BUTTERWORTH & SONS' DRYING MACHINE.

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boxes on the inner side, but this rendered them much more difficult of access, and at the same time there was a greater tendency for them to blow out with the steam pressure. The length of bearing also obtainable for the axles was much less. In drying machines as usually constructed, the practice has been to introduce the steam to the cylinder by means of a steam pipe connecting from the exterior through the end of the journal by a countersunk joint. This arrangement did not allow of free expansion and contraction of the cylinder, and caused the end of the journal to press against the end of the steam pipe with more or less force, depending on the temperature to which it was raised, producing consequently more or less friction.

Motion is communicated from one cylinder to another by cast iron gearing, seen very distinctly in the engraving. The cylinders are carefully made, but no special balancing is required, such as is necessary in drying machines for paper making, the material to be dried in the present case being of much stronger texture.

In machines with wide cylinders, where more than one width of material is dried at the same time, the steam is so applied that each width is dried uniformly. A uniformity of temperature is maintained throughout the machine by allowing the steam to enter the top cylinder at one end, and the corresponding bottom cylinder at the other. The working pressure of the steam is usually from five to ten pounds per square inch, and it is controlled by an efficient regulator. The water of condensation is removed from the opposite end of the cylinder to that at which the steam enters, by means of Collins' patent trough, a device very extensively used in England, and quite effective in its operation, causing the water to pass out through the journal in a similar way to that by which the steam enters at the other end. The material to be dried, before entering around the cylinders, passes first through a "stretcher," made of brass, which prevents the edges from turning down, and smooths out all wrinkles, delivering it perfectly even and regular. The tension of the fabric is controlled by passing it between three rectangular bars, alternating above and below them, one after the other, and around a roller; or in another way by means of a strap and weight attached to the roller, from which it moves on to the drier.

ENGINEERING INVENTIONS.

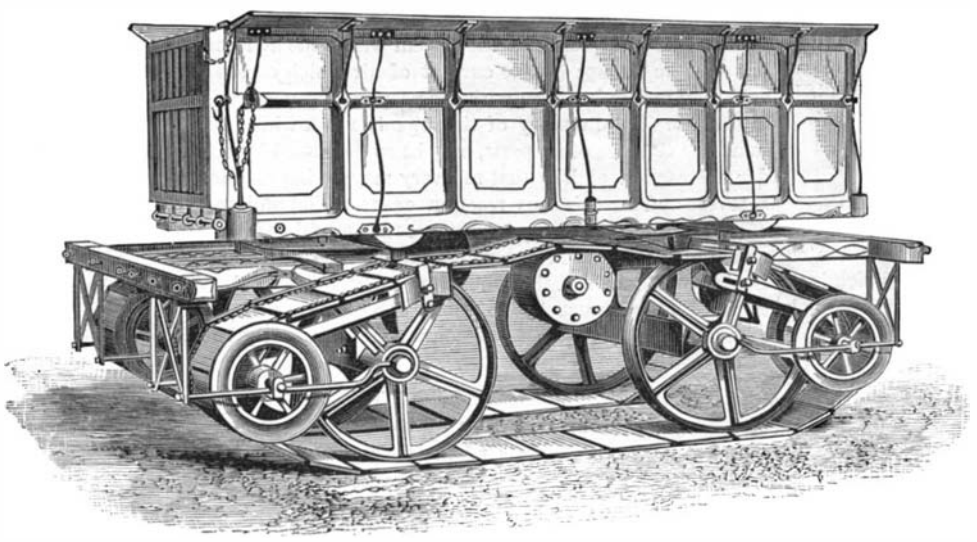
An improved aerial ship has been patented by Mr. Watson F. Quinby, of Wilmington, Del. The peculiar construction of this machine cannot be described without an engraving. The upward as well as the lateral movements are made by winged wheels of novel construction.

An improvement in permanent ways for tramways has been patented by Mr. Silas Nicholls, of St. Clement Danes, County of Middlesex, England. The object of this invention is to construct a tramway capable of resisting for a lengthened period the damaging effects of rain, frost, and snow, and in which the tram rails and the paving of the road on either side of them are kept firm and (so far as the durability of the road materials will admit) of uniform surface level. The invention enables the rails (when the road paving is fairly worn below their level) to be lowered until they are again flush with the surface of the road without taking up the whole of the paving between the rails.

Mr. George W. Dixon, of Spring Lake, Mich., has patented an improvement in valves for steam pumps, the object of which is to simplify the construction of valves for direct acting steam pumps, and thereby reduce the first cost of such pumps and the expense of repairs. The improvement consists in a double seated slide valve, similar to the ordinary slide valve fitted within a case in the steam chest, in which the valve slides, the space at the ends forming steam chambers, into which the steam is admitted alternately to move the slide valve. The admission of steam to the chambers is effected by means of an auxiliary valve in the steam chest, which is operated by means of shifting levers that are acted upon by the piston head in the engine cylinder.

An improvement in railroad frogs has been patented by Mr. Michael McAleenan, of Peoria, Ill. This invention relates to the joint or intersection of the rails of railroad frogs. It is designed to strengthen the joint and prevent dislocation. The improvement consists in prolonging the web and base of one rail in the form of a tongue, that extends toward the point of the frog in the space between the head and base of the other rail.

An improvement in gates for railroad crossings has been patented by Mr. Thomas Meehan, of Brooklyn, E. D., N. Y., and Mr. Colin McLean, of Jamaica, N. Y. The invention consists in the combination of a vertical frame provided with the side posts, and the two trusses for supporting suspended railroad gates and their operating mechanism. Two sets of chains or ropes, and two sets of pulleys, two weights, and four pairs of bevel gear wheels, are employed in moving the gates and retaining them in the required position.



SELF-LAYING TRAMWAY.

Mr. Harrison Gillett, of Lake City, Minn., has patented an improvement in steam generators fitted for burning straw or hay. The object of the invention is to provide a regular and uniform feed of the material without requiring the fire-doors to be opened, to prevent ashes and sparks entering the boiler flues, and to effect the removal of ashes as fast as they accumulate. The inventor makes use of a cylindrical boiler fitted with an inner cylindrical fire space, smoke box, and return flues through the water space. The fire doors at the front are fitted with adjustable feed rollers driven by gearing and a feed table. At the rear of the fire box ash and spark arresters are fitted, and the smoke and ash box is fitted with a pipe from the boiler for wetting down the ashes, and with a spiral conveyer for delivering the ashes to the outside.

New Brake.

A novel form of railway brake has been invented by Mr. W. Wiseman, of the East Indian Government Railway Department. In the specification it is stated that sand is placed in a chamber fitted with valves, which when opened allow the sand to pass into a second chamber, in which revolve blades attached to the axle of the vehicle. The motion of these blades is arrested by the rush of sand impinging and clogging. The above suggests the idea that a small steam turbine or rotary engine might be attached to each car axle, and by letting on steam from the locomotive, turn the wheels backward, and so stop the train.

SELF-LAYING TRAMWAY.

The vehicle shown in the engraving is fitted with a continuous self-laying and self-adjusting tramway. It was among the novelties of a recent Royal Agricultural Show, being exhibited by Mr. W. C. Pellatt, of Red Lion street, Clerkenwell, England. As will be seen by the annexed engraving, the tramway is composed of plates of hard wood, faced and strengthened with metal, and attached to two parallel endless chains, which pass round revolving guides or drums at the ends of the vehicle, and both over and under the wheels. The chief points in which this arrangement differs from others of a similar character are the gain of a fixed rail without loss of power by friction, the endless chain of plates resting on the top of the van wheels, and being carried forward by them. In this way a free and noiseless action is secured. The under carriages, constructed on the bogie principle, lock simultaneously, thus causing the front and hind wheels to run in the same track, and also enabling the vehicle to turn a very sharp corner. The shafts, however, can be fixed at either end, so as to avoid the necessity for turning in narrow or inconvenient places.

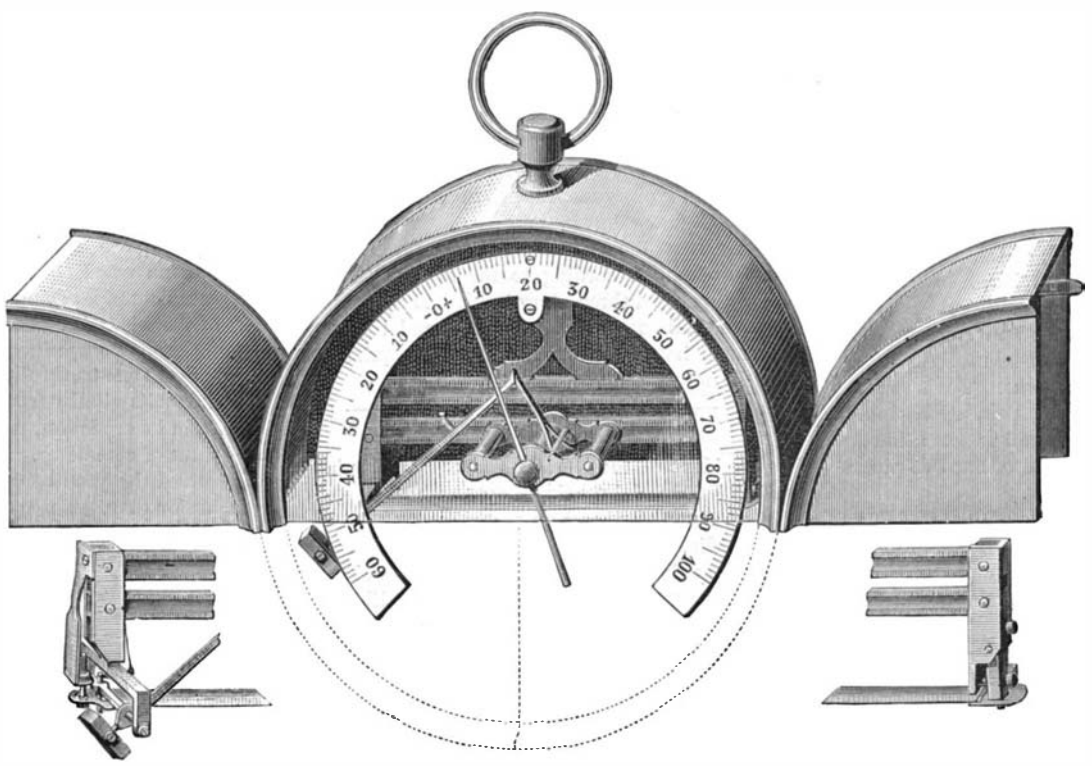
The body of the vehicle projects over the wheels, thus giving an increased capacity of over thirty per cent. A light four-wheeled van, fitted with this apparatus, and loaded up to 1 ton weight, may easily be drawn by one man; and over very heavy or plowed land, the gain is proportionately greater. In this latter case the plates of the endless chains are constructed of a sufficient width to well cover furrows or ruts.

The first two vehicles that were constructed under this patent were a farm wagon capable of carrying from seven to eight tons, and a vehicle for goods or passengers, suitable for high speed.

A NEW METALLIC THERMOMETER.

M. Tremischini's object in the construction of this thermometer, in which the expansion of one metal alone gives the measure of atmospheric temperatures, was to do away with the two inconveniences inherent to the nature of glass —its radiating and absorbing power. It was these inconveniences that the illustrious Tyndall had in view when he remarked that a glass thermometer suspended in the air does not give the temperature of the latter.

But in selecting a metal as an indicator of temperature, the inventor has not been unmindful of the fruitless experiments of those who have preceded him in this field. So, in this new thermometer, there is no system of coupling together two or more strips of unequally expansible metals, no curves especially, of any nature whatever. The metallic strip is made of very hard laminated copper, slightly platinized to prevent oxidation; or it may be of silver. Its thickness is only one hundredth and a half of a millimeter, so that it may possess the highest degree of sensitiveness. The dial of the instrument, on which the temperatures are marked by means of an index needle, rests on a frame which is deserving of a special description.



A NEW METALLIC THERMOMETER.

This frame is composed of two parallel metallic bars, one of steel and the other of copper, connected at their ends by metallic cross pieces. They are represented at the right and left of the accompanying figure. The upper horizontal cross piece, being fixed solidly to the two bars, maintains them at a constant right angle with it; while the lower cross piece, being fastened by two carefully adjusted pins, allows the two other angles of the quadrilateral to become modified under the influence of the unequal elongation of the bars. Taken as a whole, then, the frame forms a rectangular trapezium, one of whose sides (the lower one) may assume different inclinations. This movable side is prolonged beyond the trapezium, and to this prolongation, at a point previously determined by calculation, is fixed the sensitive strip of metal. As for the opposite side of the frame, it ends in a forked appendage, the two branches of which contain an M shaped mortise, and in this rests a movable blade. It is to one of the surfaces of the latter that is attached the other extremity of the sensitive strip. As a result of this arrangement the two points of the frame, to which are fixed on the one hand the oscillating blade and on the other the sensitive strip, are

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at an invariable distance apart, whatever be the variation of the temperature.

The expansion of the sensitive strip causes the oscillation of the blade, which, at its lower part, carries a lever. This lever transmits motion to the index needle through an intervening system, whose results are of a remarkable importance, since there is neither chain nor rack, nor especially any antagonistic spiral. To the bottom of the lever is fitted a very small V shaped piece of steel, the apex of which points toward the axis of the index needle. The axis contains two diverging grooves corresponding exactly with the two branches of the lever, and the latter are maintained constantly in place in the groove by means of another small piece fitted also to the bottom of the lever. It is now easy to understand that, every time that the lever receives an impulse from the sensitive strip, its V shaped appendage will necessarily transmit this motion, and that too, *without any loss of time*, to the axis of the needle, whatever be the degree of the impulse received, and whatever be the direction in which it takes place. In this thermometer, then, are united all the conditions that are indispensable for important observations; since, in its construction, the author has made it his object to avoid curves and the coupling of two strips, and to obviate the inconveniences pointed out by Tyndall as attending the use of glass thermometers.—*La Nature.*

MECHANICAL INVENTIONS.

Mr. Joseph V. Morton, of Winchester, Ky., has patented an improvement in balance wheels, the object of which is to connect the balance wheel with the band wheel shaft in such a way that when the wheel is moved in the direction for operating the machine the shaft is engaged, and communicates the motion through the belt wheel; but when the motion of the wheel is reversed the shaft is released, remaining stationary

Mr. Edward Wilkinson, of Sheffield, County of Yorkshire, England, has patented an improved light and cheap form of shears, the blades, shanks, and bows of which are composed of flat steel, the whole being in one plane with the exception of the bow, which is curved sidewise, either in one regular or irregular curve, for the purpose of giving elasticity to it.

Mr. Richard J. Skinner, of Oswego, N. Y., has patented an improvement in middlings separators, which is quite simple, and will, it is said, do its work rapidly and thoroughly. The invention cannot be described without diagrams.

Mr. Wilson N. Fort, of Lewisville, Ark., has patented an improved gate composed of parallel bars, one fixed between side posts, and the remainder pivoted in lazy-tongs, on either side, which depend from the fixed bar. The upper pivoted bar is connected with a chain running over a pulley sustained on a rod connecting the two upper ends of the lazy-tongs, by pulling which the lazy-tongs are folded up or contracted and the gateway opened.

An improved tellurian has been patented by Mr. Stephen D. Engle, of Hazleton, Pa. This improvement relates to apparatus for the use of schools in teaching the science of astronomy; the object is to furnish a simple and inexpensive apparatus for presenting in a manner that may be readily understood by the pupil the various phenomena connected with the movements of the earth and moon in relation to each other and around the sun, such as the recurrence of day and night, the changes of the seasons, the eclipses, the elliptic orbit of the earth, and the passage of the sun through the signs of the zodiac, etc.

Mr. William M. Myers, of Asherville, Kan., has patented an improved churn, in which the churn body is hung as a weight on the end of a pendulum rod that is vibrated by an escapement and wheel driven by spring or other power. By this means the required agitation of the milk or cream is secured with the expenditure of a small amount of power.

An improved machine which will pare, core, and quarter apples without removing them from the fork, has been patented by Mr. Thomas G. McConnell, of Collinsville, Ill.

Mr. William C. Hooker, of Abingdon, Ill., has invented a trap for catching small animals, such as rats, gophers, and minks, by setting the trap in the holes and runways frequented by such animals; and it may also be used for larger animals by making it of suitable dimensions. The trap consists of a wire shaped to form a loop, spur, spring, and bow, with a trigger having an abutment and an extension up into the bow, the entire trap being formed of but two pieces of wire.

Messrs. Charles S. Moseley and Abraham Bitner, of Lancaster, Pa., have patented a safety pinion that moves its arbor in one direction by a spring catch of peculiar construction, and permits free movement of the pinion in the opposite direction without effect upon the arbor.

American Institute Exhibition.

The marked improvement in general business has had its effect upon the Exhibition of this Institute, which is to open on the 17th of September. Since 1870 no year has equaled the present in the demand for space, or in the superior character of the exhibits. Should this notice meet the eye of any person intending to make an exhibit, no time should be lost in applying for space. Applicants should address the General Superintendent, American Institute, New York.

THE large number of coal oil tanks and refineries struck by lightning shows some peculiar susceptibility of these structures or their contents for attracting electricity. There would seem to be a good field in this direction for scientific investigation and a remedy.

Catching Cold.

This pertinent question is just now engaging attention. There is another question which should be answered first, namely, What is cold? The old idea of a "chill" is, perhaps, nearer the truth than the modern notion of a "cold." The hypothesis would seem to be that a 'cold" is something more than a cold, because, it is said, "You do not catch cold unless you are cold." The fact is there are probably as many diverse occurrences grouped and confounded under the generic title of cold-catching as diseases covered by that popular term fever, which is made to comprise every state in which the pulse is quickened and the temperature raised. By a parallel process of reasoning, "cold" ought to be limited to cases in which the phenomena are those of a "chill." When a person "catches cold," either of several morbid accidents may occur: (1) He may have such a chill of the surface as shall drive the blood in on the internal organs and hamper some weak, or disorder and influence some diseased viscus; (2) the cold may so impinge on the superficial nerves that serious disturbance of the system will ensue and a morbid state be set up; (3) the current of air which causes the cold may in fact be laden with the propagating "germs" of disease; or (4) the vitality of the organism as a whole, or of some one or more of its parts, may be so depressed by a sudden abstraction of heat that recovery may be impossible, or a severe and mischievous reaction ensue. The philosophy of prevention is obviously to preserve the natural and healthy action of the organism as a whole, and of the surface in particular, while habituating the skin to bear severe alternations of temperature by judicious exposure, and natural stimulation by pure air and clean water, and orderly habits of hygiene and health.—*Lancet.*

Immigration Statistics.

According to the records of the Commissioners of Emigration 3,772,707 aliens landed at the port of New York, from August 1, 1855, to January 1, 1879. Of these 1,521,566 gave their destination as New York, and 354,803 went to Illinois, 195,607 to Ohio, 81,955 to Iowa, 69,369 to Missouri, 51,863 to California, 47,687 to Indiana, 38,792 to Utah, 21,738 to Kansas and 19,728 to Nebraska. The destination of the remainder is unknown.

At a conference of delegates representing 200,000 English miners, held in Manchester recently, a resolution was unanimously passed in favor of emigration to the United States.

Similar action has been taken by the Amalgamated Engineers Society, whose headquarters are in London. The engineers on strike in Bradford have been urgently invited to come to this country, with promise of immediate employment and better wages than they can ever hope to get in England. It is said that some 300 Bradford engineers are prepared to emigrate, with assistance furnished by the society.

Killing Flies with Gunpowder.

The Pittsburg *Telegraph* tells how a restaurant keeper got rid of the flies that infested his place. The doors and windows were closed and a train of very fine gunpowder was laid in narrow strips over the floor, and the spaces between the strips were carefully painted with molasses. In an incredibly short time all the flies in the room seemed to be on the floor, enjoying the luxurious repast so temptingly set before them. It was but the work of an instant to fire the train: the result, when carefully weighed, was two pounds three ounces of dead flies. How many ounces of gunpowder were used is not stated.

Steam Heating in Troy.

The work of laying the pipes for the new system of heating is going on rapidly in Troy, the contractor expecting to have them all down by the middle of September. By the middle of August the company had over three hundred subscribers booked. According to the *Budget*, the estimated cost of fitting up a three story brick house with necessary piping and radiators was about $200, and the expense of heating such house by steam, using all required, day and night, will not exceed $20 per year.

Virginia's Oyster Trade.

The president of the Norfolk Oyster Packing Association says that 3,000,000 bushels of oysters will be taken from Virginia waters this year, and more than one third of these will be handled by the packers of Norfolk and Portsmouth. The average value of the oysters is 35 cents a bushel, making the oyster trade of Norfolk something like $350,000 a year. The business has been built up since the war, and is steadily increasing.

IT is stated that Professor Mayer, of Boston, recently put a soft-shelled potato bug larva into carbolic acid for three days, and then boxed it up and sent it to Europe for a zoological specimen. Nothing daunted by the 15 days' journey under such discouraging circumstances, when it reached the old country the bug was found able to eat potato vines as cheerfully as ever.

AT a recent session of the Anthropological Society of Paris, a debate took place on the origin of the blonde race of mankind. Some of the speakers considered that the region of Turkestan was their original seat, while others—in particular Madame C. Royer—maintained that they had originated in Europe.

RECENT AGRICULTURAL INVENTIONS.

An improved cultivator, so constructed that the plows may be readily adjusted to work deeper or shallower in the ground, as may be desired, has been patented by Mr. Cager Hardgrave, of Clarksville, Ark. The invention consists in the combination of the upright rods, having collars and set screws, by which the plow beams are supported at any required height. The improvements are covered by two United States patents.

Mr. George W. Carroll, of Union City, Pa., has patented an improved horn tip for cattle, which may be secured to the horns without liability of breaking or otherwise injuring them; and it consists in wooden tips incased in metal sleeves attached to chains on which are elastic rings adapted to fit the tapering horns and yield to their growth. They are connected together between the horns by a loop so that the chains can be taken up or shortened at pleasure, to adapt them to different cattle.

Mr. Asa Newsom, of Valdosta, Ga., has patented an improvement in plows. The object of this invention is to improve the construction of the plow for which letters patent No. 199,736 were granted the same inventor, January 29, 1878. The invention consists in combining a curved slotted standard, with a plow beam secured between upper ends of standard, and provided with an extension having an eye, and bars that connect the standard and handles.

An improvement in the class of cultivators whose beams are so connected as to adapt them for lateral adjustment, and which have pivoted adjustable standards, has been patented by Mr. Columbus Stephens, of Cave Spring, Ga. The improvements relate to the construction and attachment of the braces for the standards.

Progress of Shipbuilding.

The records of the Treasury Department show a decided increase in the building of steam vessels this year. The returns for the last quarter of the fiscal year were not all in, but enough had been received to warrant an estimate of an aggregate for the year of upwards of 88,000 tons. The total tonnage of steam vessels, built the preceding year, was 81,860, and during 1877 only 47,514. A considerable increase is also probable in the number of sailing vessels, barges, and canal boats. Full reports will be submitted in October.

A very considerable impulse to this department of American industry is foreshadowed in a cable press dispatch from London, to the effect that negotiations between a syndicate of American shipbuilders and the Russian Government had culminated in a large order for American built vessels. According to the dispatch, Admiral Lessowsky, Russian Minister of Marine, had signed a contract with these American ship building firms for the construction of a number of ocean corvette cruisers, which will cost about $17,000,000.

Tobacco Pipes in Germany.

An official inquiry into the extent of the tobacco trade in Germany has brought out some interesting statistics with regard to the trade in tobacco pipes.

The chief center of this branch of industry is Ruhla, in Thuringia. In that town and the neighboring villages the annual production for the past few years has averaged 540,000 genuine meerschaum bowls or heads, and 5,400,000 artificial or imitation meerschaum bowls. The number of polished, lacquered, and variously mounted wooden pipe heads annually produced was 4,800,000. Of the common porcelain bowls, the favorite pipes of the German peasantry, there were manufactured every year 9,600,000, and of fine clay or lava bowls, 2,700,000. Further, there has been an annual average production of 15,000,000 pipe stems or tubes, of various sizes and materials; 1,600,000 dozen of miscellaneous adjuncts, such as flexible tubes, chains, tops, tufts, etc.; 12,000 dozens of meerschaum pipe cases, 800,000 dozen mouth pieces and cigar holders of amber or horn and meerschaum wood, or cocoanut shell; and, finally, 15,000,000 complete pipes composed of various materials. The value of the whole is estimated at about $5,000,000.

SOME one truthfully says that the science of mechanics draws its vitality from coal and iron. Coal emancipates iron from its crudeness and furnishes it with power as an instrument of commerce. The union of these two minerals has solved the question of production, and has rendered distribution easy. The world is embarrassed only with the difficulty of consumption. Coal fashions iron and drives the finished machine. The dirty thing is the great vehicle of civilization. Iron is an instrument; coal is a cause. Iron is an agent of industry, and coal is a master power.

TWO interesting specimens of the orang-outang have been placed in the Jardin d'Acclimatation, Paris, the older one having been captured with others, at Borneo, after a desperate chase, in the course of which eight natives, the French (not Barnum) say, lost their lives. The animals, according to the account given, were run into an elephant trap, thirty feet deep, and were gradually reduced by hunger to a state of weakness, when they were garroted and shut up in a cage. The oldest one measures about five feet, and is said to be the largest ever brought to Europe,

THE NICARAGUA CANAL.—Rear-Admiral Ammen states that General Grant has telegraphed his willingness to accept the presidency of an American company to construct an interoceanic canal, with a distinct preference for the Nicaragua route.

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Correspondence.

A Five Legged Frog.

To the Editor of the Scientific American:

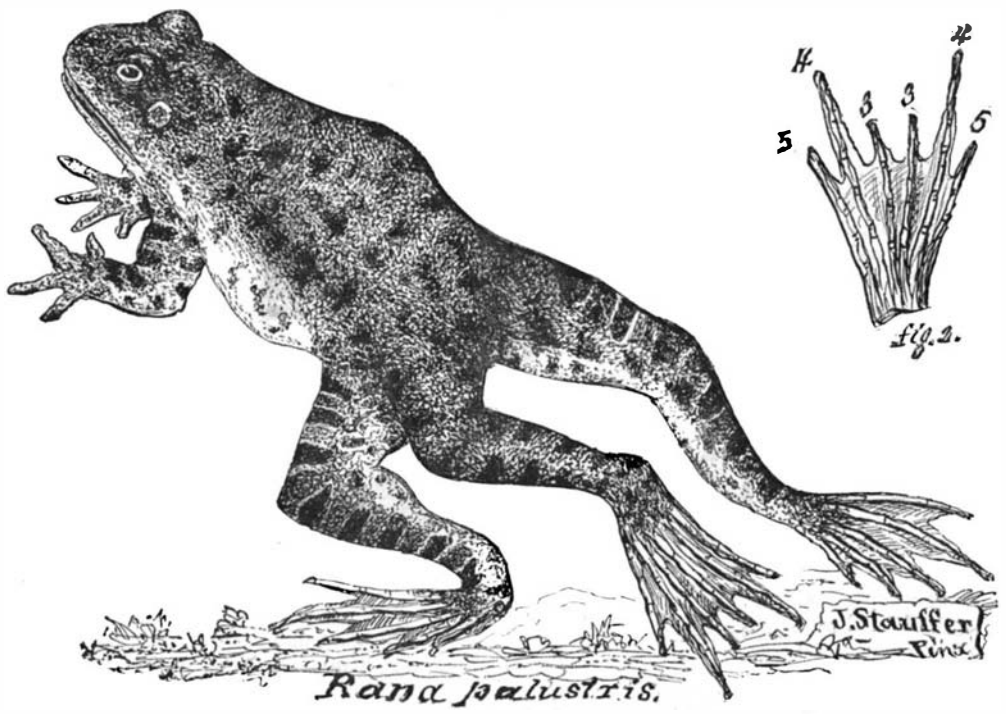
I notice a fine figure of a "three legged woodcock" in the SCIENTIFIC AMERICAN, No. 2, for January 11, 1879, page 23. You remark that "it is rare that monstrosities in nature are ever able to hold their own in the struggle of life." Being handy at drawing, I herewith send you a sketch of a fully matured frog (*Rana palustris*) having five full sized legs, as a counterpart to the woodcock. This was captured in the Conestoga, near the city of Lancaster. I sent a drawing and description to my young friend, John A. Ryder, of the Academy of Natural Sciences, Philadelphia. He wrote the following notice of it, which was published in the *American Naturalist*, vol. xii., p. 751, but not illustrated, which reads.

"A MONSTROUS FROG.—Mr. Jacob Stauffer, the veteran* naturalist of Lancaster, Pa., sends me a drawing of a frog (*Rana palustris*) with a well developed extra hind limb, or what appears from his drawing and description to be, speaking more correctly, a united pair of hind limbs, though occupying an asymmetrical position, and having their true homologies to a certain extent concealed from this cause. A sketch and remark of Mr Stauffer's, however, shows the true nature of this limb to be compound; that is, that it consists of two united halves divided by development from both sides of the body. He remarks: 'The extra leg is of the same color above and below, while the others, or normal legs, are of a dirty yellowish color beneath.' He further says this leg has six instead of five toes, and gives a sketch, which leads me to think that the digital formula of the compound foot must be written in this manner, 5, 4, 3, 3, 4, 5, showing clearly that the limbs are fused together by their inner faces, thus bringing the outer or fourth and fifth toes to the outside, while the prevalence of the superior and outer dark colors, and concealment of the inferior yellow tints, is just what ought to happen in the event of such union."

I quote Mr. Ryder because he presented my ideas in better shape than I had done. I will only add that this frog was alive for five days at Mr. Snyder's saloon, in this city, with a fish hook through the upper jaw. He was made to swim and hop to amuse the crowds of callers. Poor frog, although vigorous and able to use his additional appendage lustily as an oar or leg in his gymnastics, he had just given up his vitality when I laid him out and took an accurate drawing of the creature, which is now preserved in alcohol for inspection. I have heard of a similar frog in one of the Eastern museums.

J. STAUFFER.

Lancaster, Pa.



A FIVE LEGGED FROG.

Crabs of Cape Verde Island.

A rock crab (*Grapsus strigosus cf.*) was very abundant, running about all over the rocks, and making off into clefts on one's approach. I was astonished at the keen and long sight of this crab. I noticed some make off at full pace to their hiding places at the instant that my head showed above a rock 50 yards distant. The crab often makes for the under side of a ledge of rock when escaping from danger, and may then be caught resting in fancied security by the hand brought suddenly over it from above.

The dry rocks were covered with the dung of the crab, which is in the form of small, brittle, white sticks about an inch in length, very puzzling objects at first sight. The cast shells of the crab, which are bright red and very conspicuous, were lying all over the rocks. At Still Bay, on the sandy beach on which, although it is on the leeward side of the island and the sea surface was smooth, a heavy rolling surf was breaking, I encountered a sand crab (*Ocypoda ippeus*) which was walking about, and got between it and its hole in the dry sand above the beach. The crab was a large one, at least 3 inches in breadth of its carapace. In this species of crab the eyestalks are very long. The eyes are on the side of the stalks, which are longer than eyes, and projecting above them are terminated by a tuft of hairs. When the animal is on the alert these long eyestalks are erected, and stand up vertically side by side far above the level of the animal's back.

With its curious, long, column-like eye serect the crab bolted down toward the surf as the only escape, and as it saw a wave rushing up the shelving shore dug itself tight into the sand and held on to prevent the undertow from carrying it down into the sea. As soon as the wave had retreated it made off full speed along the shore. I gave chase, and whenever a wave approached the crab repeated the maneuver. I once touched it with my hand whilst it was buried and blinded by the sandy water, but the surf compelled me to retreat, and I could not snatch hold of it for fear of its powerful claws. At last I chased it, hard pressed, into the surf in a hurry, and being unable to get proper hold in time it was washed down into the sea. The crab evidently dreaded going into the sea.

These sand crabs breathe air through an aperture placed between the bases of the third and fourth pairs of walking legs, and leading to the gill chamber. They soon die when kept for a short time beneath the water, as shown by Fritz Muller's experiments.—*H. N. Moseley's Notes.*

* He means because I am over 70 years of age I am a veteran—as a naturalist.—J. S.

Winding Up a Horse.

The Rev. Dr. Chamberlain, in a letter to the *American Missionary*, from Mudnapilly, India, gives the following singular experience he had with a balky horse:

Nineteen years ago, says the venerable divine, I bought in Madras a peculiar kind of horse. He had to be wound up to make him go. It was not a machine, but a veritable live horse.

When breaking him to go in the carriage he had been injured. An accident occurred in starting him the first time, and he was thrown and hurt and frightened. It made him timid; afraid to start. After he had once started he would never balk, until taken out of the carriage. He would start and stop and go on as many times as you pleased, but it was very difficult to get him started at first each time he was harnessed to the carriage.

He was all right under the saddle, an excellent riding horse, and would carry me long distances in my district work, so that I did not wish to dispose of him; but I could not afford to keep two; whatever I had must go in carriage as well as ride, and I determined that I would conquer.

How I have worked over that horse! At first it sometimes took me an hour to get him started from my door. At last, after trying everything I had ever heard of, I hit upon an expedient that worked.

I took a strong bamboo stick two feet long and over an inch thick. A stout cord loop was passed through a hole two inches from its end. This loop we would slip over his left ear down to the roots, and turn the stick round and round and twist it up.

It is said that a horse can retain but one idea at a time in its small brain. Soon the twisting would begin to hurt. His attention would be abstracted to the pain in his ear. He would forget all about a carriage being hitched to him, bend down his head, and walk off as quiet as a lamb. When he had gone a rod the horse boy would begin to untwist, soon off would come the cord, and the horse would be all right for the day. The remedy never failed.

After having it on two or three times he objected to the operation, and would spring about and rear and twitch and back, anything but start ahead, to keep it from being applied. We would have, two of us, to begin to pat and rub about his neck and head. He would not know which had the key. All at once it would be on his ear and winding up. The moment that it began to tighten he would be quiet, stand and bear it as long as he could, and then off he would go. It never took thirty seconds to get him off with the key. It would take an hour without. After a little he ceased objecting to have it put on. He seemed to say to himself, "I have got to give in, and may as well do it at once," but he would not start without the key. In a few months he got so that, as soon as we got into the carriage, *he would bend down his head to have the key put on*, and one or two turns of the key would be enough.

Then the key became unnecessary. He would bend down his head, tipping his left ear to the horse boy, who would take it in his hand and twist it, and off he would go.

My native neighbors said, "That horse must be wound up or he cannot run." And it did seem to be so.

When he got so that the "winding up" was nothing but a form, I tried to break him of that, but could not succeed. I would pat him and talk to him and give him a little salt or sugar or bread, and then step quietly into the carriage and tell him to go. "No." Coax him. "No." Whip him. "No." Legs braced, every muscle tense for resistance. A genuine balk. Stop and keep quiet for an instant, and he would hold down his head, bend over his ear, and look around for the horse boy appealingly, saying very earnestly by his actions, "Do please wind me up. I *can't* go without, but I'll go gladly if you will." The moment his ear was touched, and one twist given, off he would go as happy and contented as ever horse could be.

Many hearty laughs have we and our friends had over the winding up of that horse. If I were out on a tour for a month or two and he were not hitched to the carriage, or if he stood in the stable with no work for a week or two during the monsoon, a real winding up had to take place the first time he was put in. We kept him six years. The last week I owned him I had to wind him up. I sold the patent to the man that bought the horse, and learned from him that he had to use it as long as the horse lived.

Should City Horses be Turned Out to Pasture?

Grass is the natural food of the horse. In spring and summer the fresh green herbage of the field and mountain springing up among the rocks, along water courses, or in the valleys, seasoned with the twigs of shrubs and trees, and the great variety of other plants which are both pleasant to the eye and good for food, constitute a rather bulky but nutritious and acceptable aliment. This food distends the paunch and gives an outline to the animal, which, as concerns city horses, is, to say the least, unfashionable. Very heavy horses, high bred horses, and even those accustomed from colthood to concentrated food, especially to receiving oats regularly, and whose skins are thin from having had regular grooming, protection from the weather and from the attacks of flies, do not do well as a rule when turned to pasture. It is hard to make city people understand this. This is true—and being true, ought city horses ever to be turned to grass? Certainly not in all cases. If they have a good, deep, dark shed to go under at will, to get away from insects, and to protect them during cold storms; copse and young woody growth in which they may at will take shelter from the flies; running water in the pasture; plenty of good sweet grass, not too close cropped nor yet too rank; and about one third to half their usual feed of grain daily—say four quarts of oats and an equal measure of bran—and access to salt at all times, they would do well—not gain in flesh, probably, but they would come through the summer looking fly bitten, perhaps; but, nevertheless, in such shape that they would soon get into first-rate working order, with a new lease of life from the change. It is quite as important for farmers to understand this as for the city owners of horses—and much hard feeling saved, and perhaps the annoyance of lawsuits may be avoided, by the knowledge. There should always be a proper understanding of exactly what is to be done by the party taking the horses.—*American Agriculturist.*

[After considerable unfortunate experience in turning horses out to recuperate in pastures during the summer, we have come to the conclusion that horses accustomed to city work and care, whose condition is tolerably good, are seldom benefited, but are often injured, and never come back to their work in as good trim as when sent away.—EDS.]

Our Ferry Traps.

The frequent narrow escapes from fearful catastrophes make it necessary that we should again call the attention of steamboat inspectors to their duty in this regard. It is not too much to state that New York has the best as well as the worst managed ferries on the continent. And yet the best are far from being what they may and should be, where the interests involved are of such vast magnitude. It is not uncommon to find 1,000 persons crowded on board one of the boats of the Fulton ferry at certain hours of the day, and more at night. It is hardly within the power of language to describe the horrors which would ensue were a boat thus loaded to sink, from whatever cause, whether from collision caused by fog or by ice. These excessive freights of humanity may be witnessed several times on every working day of the year.

The boats of all our ferries, and especially the one named, should have their vacant space below deck filled with copper bound oil casks, since it has been proven that water tight compartments are a myth. Their upper decks should be covered with life rafts. The life preservers in the cabins of the Fulton ferry boats are beyond the reach of passengers. The outside bulwarks between fenders and rail should be fitted with sectional life rafts, which could be dropped overboard in an instant.—*American Ship.*

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Remarkable Electrical Experiments.

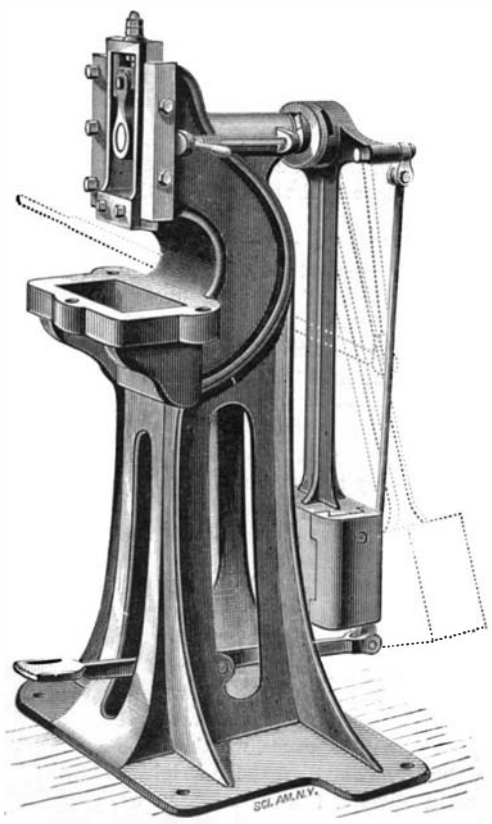
Some twenty years ago, says a writer in *Inter-Ocean*, Mr. Andrew Crosse, of Bloomfield, England, stood foremost in the grandeur of his experiments and investigations in electrical science, and his achievements ranked among the most splendid of his day, while his skill entitled him to high rank among the devoted investigators of scientific truth. Mr. Crosse collected the electricity from the atmosphere by means of a wire with points, supported on poles, fixed to the tallest of the magnificent trees which adorned his grounds. This conducting wire was carried into a room, where it terminated in a large brass ball. Near this was another similar ball, which was connected with a neighboring pond, down in the water, by means of a metal rod, and by means of an adjusting screw and large glass handle the electric discharge was easily directed into the earth by bringing the two balls together when not experimenting, or the charge was not too strong. Mr. Crosse had a Leyden battery, consisting of fifty-one gallon jars, containing seventy-three square feet of coated surface on each side, and with about 1,600 feet of his lightning rod wire, he has frequently collected sufficient lightning to charge and discharge this battery twenty times a minute, with reports as loud as a musket. The battery, when fully charged, would perfectly fuse into red hot drops thirty feet of iron wire in one length, the wire being 1-270 of an inch in diameter. When the battery was connected with 3,000 feet of rod during a thunderstorm, a constant stream of discharges took place between these balls. And if the center of a cloud was vertical over the points, the bursts of thunder and the crash of the accumulated fluid conspired to produce an appalling effect.

A NEW PRESS.

The press shown in the annexed engraving is quite novel in principle, and although a recent invention it is rapidly coming into notice. It is adapted to a great number of uses, such as the punching and shearing of metals and other materials, stamping, embossing, etc., by foot or hand. It accomplishes work that has heretofore been done only by power presses. It performs some astonishing feats; for example, a press like that shown in the engraving will easily shear one-half by two-inch wrought iron, and punch a ¾ inch hole through 5-16 inch iron by foot power alone, and it can do more when operated by hand.

This astonishing result is obtained by the employment of a weighted pendulum, swinging back and forth or describing a complete circle if necessary. The pendulum is used in connection with an automatic clutch, a shaft, and a slide. The pendulum is easily set in motion by the pressure of the foot upon the treadle; this revolves the shaft with the same results and performs the work with the same speed as in ordinary power presses.

The weight of the pendulum may be varied to suit the work in hand, a supplemental weight being fitted to each side of the pendulum, to be attached or removed as occasion may require. The press is provided with a foot pedal, which yields to upward pressure, preventing accidents to the feet of the workman, and also avoiding breakage in case an unyielding body should accidentally get under the pedal. When required the press is furnished with a hand lever, as indicated in dotted lines. It is thus capable of rapidly



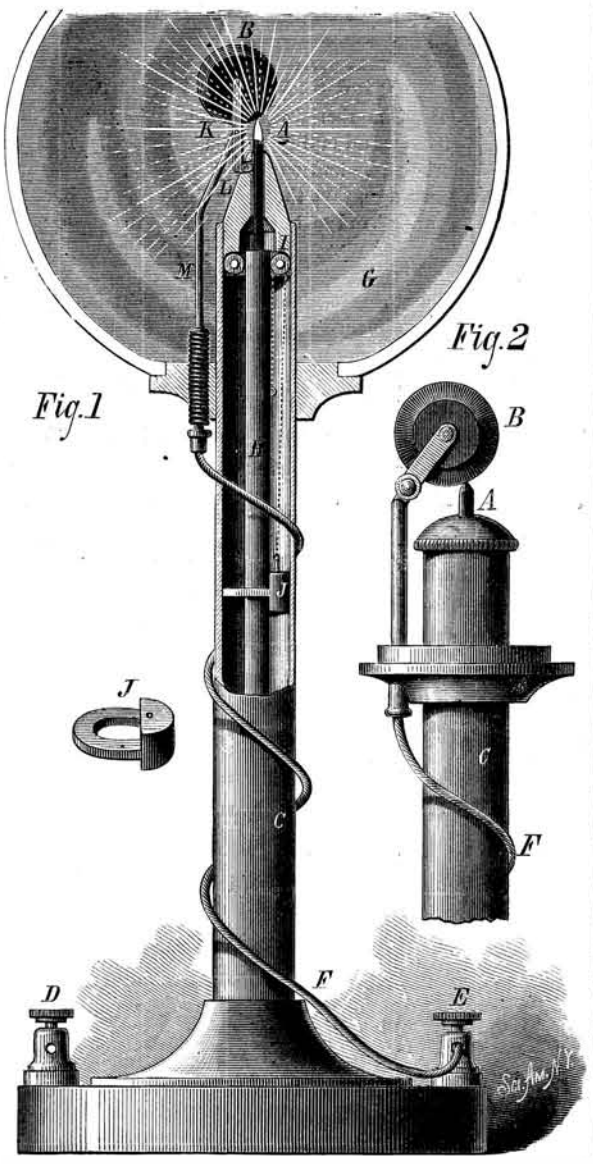
PEERLESS PUNCH AND SHEAR PRESS.

punching 1 inch holes through 5-16 iron. An ingenious stop is shown at the side of the press by which the punch may be brought into action at every oscillation of the pendulum or whenever required.

This press, and other styles on the same plan which we may hereafter describe, are made by the Peerless Punch and Shear Company, of 52 Dey street, New York city.

NEW FORM OF ELECTRIC LAMP.

The accompanying engraving represents an electric lamp (Reynier's system) designed by G. Cromé for domestic use. It is said that this lamp gives very good results when operated by six Bunsen elements. When a series of lamps is used the current should be supplied by a dynamo-electric machine. The carbons are inclosed either by a simple globe



IMPROVED ELECTRIC LAMP.

or by a bell filled with nitrogen or rarefied air, and the lamp may be used with safety in powder mills, in mines, and under water.

The carbon pencil, A, is a little less than $\frac{3}{16}$ inch in diameter. It is guided by the tube, H, and is pressed upward against the edge of the disk, B, by the weight, J, attached to a cord passing over the pulley, I. The carbon is in electrical communication with the binding post, D, and the carbon disk, B, is connected with the other binding post, E, by means of the wire, F.

The globe, G, rests upon the collar attached to the main standard of the lamp, and is entire throughout, except at the bottom. This globe may be replaced by a glass bell filled with nitrogen, which will retard the combustion of the carbons.

The disk, B, is supported by a lever, K, that is pivoted in the insulated standard, M. The lower end of this lever is bent at right angles, and is made to exert a slight lateral pressure on the carbon when the point of the carbon presses against the disk, B. The upward movement of the carbon causes the disk, B, to turn slightly, thus presenting a new surface to the action of the current.

The device shown in Fig. 2 is similar to that already described, the difference being that the regulating lever is omitted.

A Steam Rammer for Paving Streets.

The Philadelphia papers contain descriptions of a new and successful invention in use in that city for laying street pavements. According to the statements of our contemporaries it pounds granite blocks and cobble stones into place, making the surface, one paper says, as smooth as a billiard table, and promises to do away with the old style of paving the streets. The rammer, which looks like a locomotive at a distance, is operated on the same principle as a trip hammer, and can be so regulated as to make a stroke of one pound weight or 1,500 lb. This enables the operator to produce a level surface on every portion of the street it passes over, while the most expert man power cannot strike over two hundred pounds. Durability and solidity are the important features of paved streets, and while hand power can only force the stone into the earth three inches, the steam rammer sends them six inches with ease; thus making the stones compact and solid. It is claimed that the streets paved with this new invention will last until the stone is worn out. The machine weighs six and a half tons, and even that makes no rut or impression on the street which it has rammed. In repaving streets paved with cobble stones under the old system it is necessary to relay them, while, with the steam rammer, they can be driven to a level with perfect ease. It requires the services only of an engineer and a man to guide the rammer to work the machine. It consumes one fourth of a ton of coal per day. A number of streets in West Philadelphia bear splendid specimens of its work.

The Melodiograph.

Several contrivances have been invented to record the notes of melodies played on a piano, organ, or other key instrument, but were all more or less useless on account of their complexity, imperfectness, or expense.

Zigliani's melodiograph is very simple, usable, and cheap. A double flat spring placed under each key is connected with a battery and with a recording apparatus, which consists of a comb provided with insulated teeth gently resting on a copper cylinder. A strip of ruled and chemically prepared paper is drawn over this roller by a clock work, and receives the impressions or marks of the teeth of the comb. This clockwork can be regulated so as to cause the paper to move in conformity with the time kept by a person playing the instrument. Every time a key is depressed the circuit is closed, and the electricity, passing through one of the teeth of the comb, makes a mark corresponding to the key that has been depressed.

The Phosphorescence of the Sea.

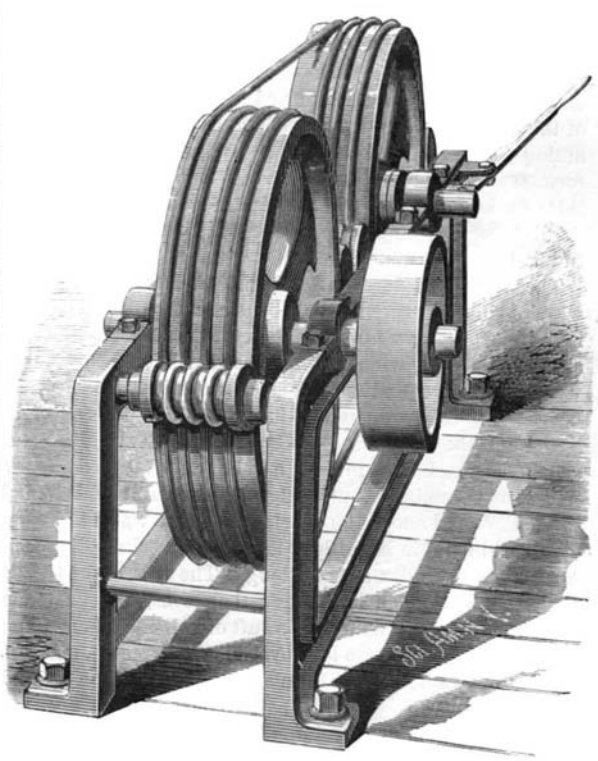
The illumination or phosphorescence of sea water at night, observable in this latitude in the summer, and at all times in tropical regions, is largely due to *Noctiluca miliaris*. It is a gelatinous little speck of a fellow, in shape like a peach, but only $\frac{1}{80}$ of an inch in diameter. The light, which is of a greenish hue, arises from scores of minute points. A glass of water taken where these creatures are present may contain myriads of them. Nets and ropes drawn through the sea pick up millions of Noctiluca; and the ropes and meshes are made luminous by them until they become dry.

NOVEL DEVICE FOR TRANSMITTING MOTION.

We give herewith an engraving of a new device for transmitting motion, invented by Messrs. Dennis, Samper & Valenzuela, of Bogota, United States of Colombia, South America. This device is intended for the transmission of power from one shaft to another, and it may be employed in transmitting continuous rotary motion or a reciprocating rotary motion.

It consists, as will be seen, by reference to the engraving, of two pulleys placed, one upon the driving shaft, the other upon the driven shaft, and connected by a belt, rope, or chain which passes several times around each pulley. When a continuous rotary motion is to be communicated from one shaft to the other the belt is endless, but when the motion is alternating the belt need not be endless; it may be wound several times upon the pulleys and have its ends attached to the pulley rims.

The belt is prevented from moving along laterally on the pulleys by the small grooved rollers journaled on diametrically opposite sides of the pulleys, and embracing the several convolutions of the belt. It is stated that the slight side pressure required to keep the coils of the belt in position on the pulleys amounts to nothing compared with the saving of power by avoiding the slipping of the belt.



DEVICE FOR TRANSMITTING MOTION.

The applications of this device are numerous. It may be used in transmitting power in place of the ordinary belt, and in most cases in place of cog gearing. It may be applied to hoisting machinery and to the transmission of power by wire ropes.

Further particulars may be obtained from Mr. Silvestre Samper, 262 President St., Brooklyn, N. Y.

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Poisoned by Revenue Stamps.

Ex-Mayor Butler, Binghamton, N. Y., has been seriously poisoned about his face and hands by handling government revenue stamps used on cigar boxes. While the weather was very hot and he was perspiring freely, he stamped and canceled the stamps on a large number of cigar boxes. Green dust flew from the stamps and covered his hands and wrists, and a handkerchief used by him for wiping his face and neck also became filled with the dust. The result was a severe and deep poisoning wherever the dust touched. There was evidence of poison breaking out on one ankle, showing that it was spreading through his system. Ex-Alderman Jackson, of the revenue office in Binghamton, has been troubled for about a year with a skin disease resembling closely the poisoned surface of Mr. Butler.

THE GREENLAND WHALE AND THE GRAMPUS.

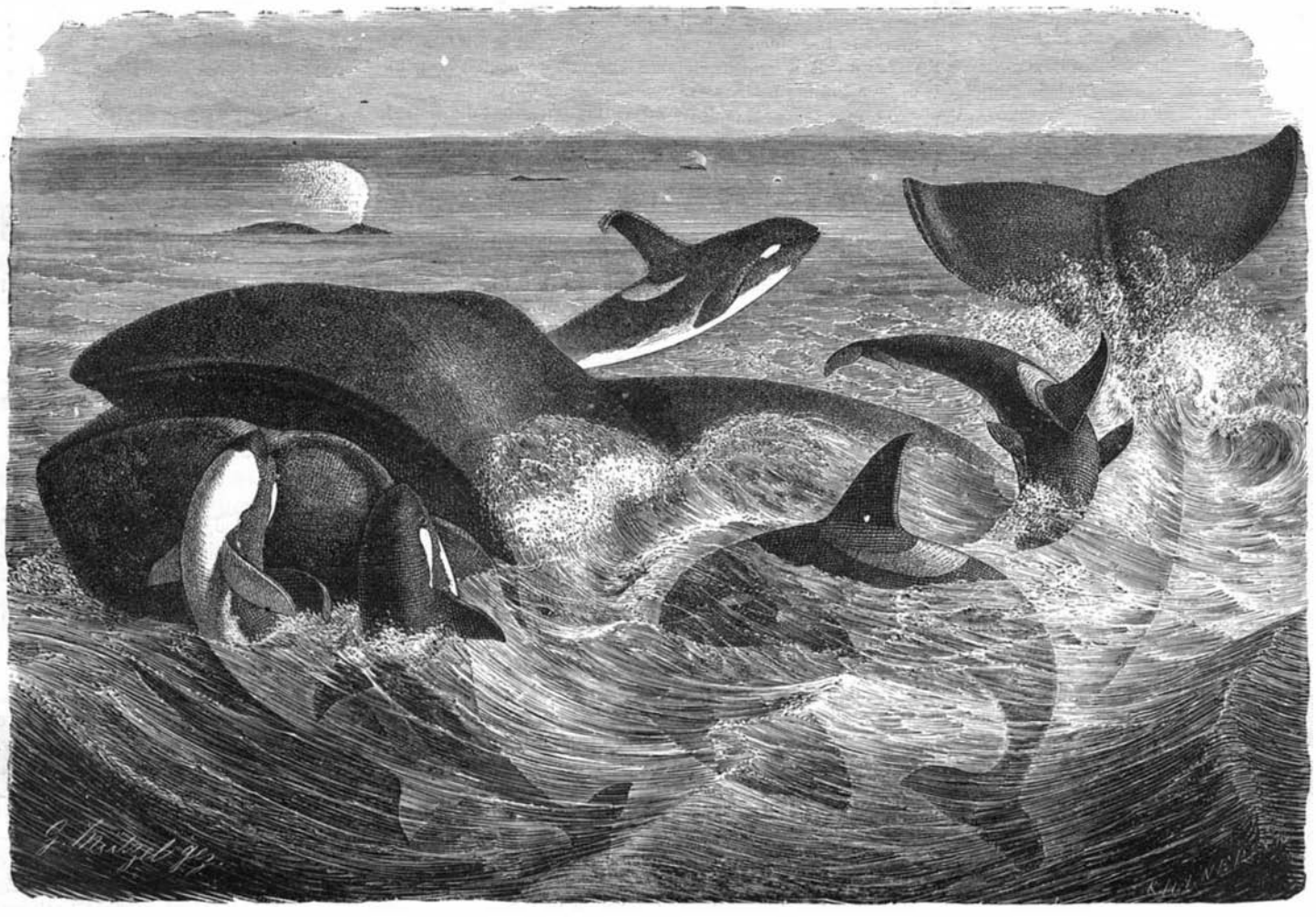
The annexed engraving represents a combat between the Greenland whale (*Balæna mysticus*) and the grampus (*Delphinus grampus*), the most voracious of the inhabitants of the ocean. It does not devour one third of the animals it kills. It is the greatest enemy of the whale, and dead bodies of whales have frequently been found having large pieces of flesh torn from the body, and the lips mutilated or destroyed. As soon as the whale opens its mouth to defend itself the grampus darts at its large soft tongue, tears it off, and causes the death of the animal.

It is said that the grampuses are fond of amusing themselves by mobbing the Greenland whale, and that they persecute it by leaping out of the water and striking it sharply with their tails as they descend. In consequence of this it has been called the thrasher or killer. The swordfish is reported to join the thrasher in this amusement, and to attack the whale from below to prevent it from diving. Whatever may be said of the latter part of the story, the former is certainly true, and is corroborated by Capt. Scott, who has often seen this strange sight.

The grampus is from twenty to thirty feet in length and from ten to twelve feet in girth. It has forty-four conical, strongly made, and slightly curved teeth. Its color is black on the upper part of the body, suddenly changing to white on the abdomen and part of the sides, and there is generally a white patch of considerable size behind the eyelid.

Although it sometimes wanders to more southern regions, its favored home is in the northern seas that wash the coast of Greenland and Spitzbergen, where it congregates in small herds.

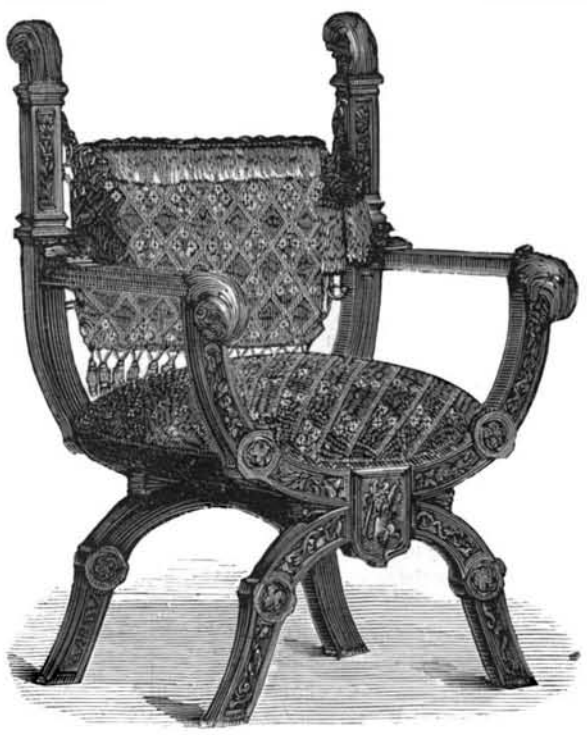
The Greenland whale, northern whale, or right whale, as it is indifferently termed, is an inhabitant of the northern seas. It is, when full grown, about sixty or seventy feet in length, and its girth about thirty or forty feet. Its color is velvety black upon the upper part of the body, the fins, and the tail; gray upon the junction of the tail with the body and at the base of the fins, and white upon the abdomen and fore part of the lower jaw. The velvety aspect of the body is caused by the oil which exudes from the epidermis, and aids in destroying the friction of the water. The jaw opens very far back, and in a large whale is about sixteen feet in length, seven feet wide, and ten or twelve feet in height. The most curious part of the jaw and its structure is the remarkable substance that is popularly known as whalebone, which is found in a series of plates, thick and solid at the insertion into the jaw, and splitting at the extremity into a multitude of hair-like fringes. On each side of the jaw there are more than three hundred of these plates, which, in a fine specimen, are about ten or twelve feet long and eleven inches wide at the base. A large whale furnishes about one ton of whalebone. These masses of whalebone are placed along the sides of the mouth for the purpose of aiding the whale in procuring food and separating it from the water.



COMBAT BETWEEN THE GREENLAND WHALE AND GRAMPUSES.

The Human Voice a Corner Stone Memento.

A great many novel articles have been placed under corner stones of public buildings and other structures about being erected. But the most novel article we have known to be thus deposited was in laying the corner stone of an academy in Massachusetts the other day. It was nothing less than a strip of the human voice imprinted on tin foil by the phonographic process. There is no comprehending the curiosity this bit of tin foil will be to the people of a couple of hundred years hence, when the corner stone shall be opened and the voice taken out, and found to articulate the words and sentiments of one long since dead and forgotten.



ARMCHAIR DESIGNED BY SCHMIDT & SUGG, VIENNA.

Artificial Formation of Felspars—Nepheline and Leucite.

F. Fouqué and A. Michel Levy have recently prepared the minerals above mentioned. Nepheline is formed when a mixture of silicic acid, alumina, and sodium carbonate, in such proportions that the oxygen of protoxide, sesquioxide, and acid are as 1 : 3 : 4, are heated together; white silk-like crystals are obtained which, under the microscope, are seen to be small hexagonal prisms (they are 0·12 min. long and 0·06 min. broad), which accord in every respect with natural crystals of nepheline. If somewhat more silicic acid be taken, like that corresponding to the proportion 1 : 3 : 4½, a completely crystalline mass is obtained, which bears in its optical characters the same resemblance to hexagonal nepheline as chalcedony does to quartz. By melting together one tenth pyroxene and nine tenths nepheline a mixture of four different minerals was obtained: nepheline, pale green spinel, garnet in brown-yellow octahedra, and microlite. Leucite was also found in the fused product, and resembled both in form and optical characters the natural mineral.—*Comptes Rendus.*

Volcanic Oil Well.

An oil well on Kendall Creek, near Tarport, Cattaraugus county, N. Y., having ceased to yield oil, the operators recently pulled up the tubing, and as no obstruction was found in that, it was decided to torpedo the well. Before arrangements were completed for the operation, a sound like that of steam escaping from a locomotive valve, and then a rumbling noise, were heard in the well, and a trembling of the earth was felt. Presently a shower of stones, ashes, and dry dust, accompanied by a dense cloud of gray smoke, was thrown in the air. The eruption lasted only a few seconds, and then oil began to flow copiously. The well has since been yielding nearly double its former quantity. The stones thrown up from the well were rough and light, like pumice stone. The ashes were red and gray.

The Grape Rot.

We recently visited the vineyards of Vineland, N. J., to ascertain with what success those were meeting who have been experimenting in protecting their vines as a remedy against the "grape rot," which has been so destructive in Southern New Jersey the past two or three years. In company with E. G. Blaisdell, the courteous and enterprising editor of the *Vineland Weekly*, we made a tour of inspection of several of the vineyards.

In the March 1st issue of the *Farmer* our correspondent from Red Plains, N. C., recommended the use of a board covering over the trellis as a remedy against rot and mildew. The idea was taken up by our Vineland grape growers, and experiments are this year being made in many of the vineyards. The experiments so far are entirely successful.

Some have experimented by using manila paper bags just large enough to hold within it a cluster of grapes. The bag is slipped over the bunch and securely pinned at the opening, and is left on until the grapes are ready for the market. We first visited the vineyard of George Scarborough, Esq., who put on five hundred bags as an experiment. In all cases where we removed the bag we found the cluster perfect, unless where the bag was not put on soon enough. Experiments thus far have shown that they should be put on about ten days after the blossoms appear, for all that were covered at that stage were found perfect. Mr. Scarborough has largely experimented this year with the board covering, and is so well satisfied with the results that next year he will cover all his grapevines with them. In every case where the board protection was used the grapes were found perfect—not a sign of rot could be found, while the next vine, left uncovered, would not be worth picking. Last year, in both his finely cultivated and extensive vineyards but one crate of grapes were picked, when the work was abandoned and given up as not paying for the labor. Last year he found that the "Concord" rotted worse than the "Ives Seedling," and the "Champion" worse than the "Concord."

We next visited the large vineyard of D. Rood, Esq. This gentleman has 30,000 paper bags in use, with results the same as in Mr. Scarborough's vineyard. One man will put on one thousand bags in a day. The extensive vineyards of Colonel Alex. W. Pearson were examined. Here the board covering only has been used, and with gratifying results, as in the other cases. The colonel is pretty well satisfied that the board covering is the remedy against "grape rot," and next year will make a wholesale matter of the covering. From our observations we would pronounce in favor of the board covering. It not only affords protection from the disease, but protects from the early frosts. The first cost is

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greater than the paper bag covering, but this is counterbalanced by the length of time it will last.

The fruit prospect about Vineland is certainly of the most encouraging nature. Large orchards of choice pear trees are laden with excellent fruit; we observed many pear trees broken down with the weight of the fruit. An unusually large crop of berries were shipped to the Philadelphia and New York markets from this place, and such a thing as "hard times" seems to be unknown among the thrifty fruit growers of Vineland.—*Ohio Farmer.*

The Entomological Club.

The Club on Entomology, connected with the American Association, held its sessions on the day preceding the general meeting. Prof. J. A. Lintner, of Albany, president, delivered an address, telling of the great advances made in the study of insects and the increasing interest manifested in the subject. At the last session of the club the names of 280 entomologists were reported. Investigation since has increased the list to 835 persons engaged in the study of entomology in the United States.

At the afternoon session many specimens of insects were exhibited, among others some from California of the *Pzudohazis eglanteriana*. Prof. Samuel H. Scudder, of Cambridge, presented specimens and a description of the operations of the *Retina brustiana*, an insect now ravaging the pine trees of Nantucket and other evergreen trees in different places. Prof. Comstock, United States Entomologist, exhibited specimens of the larger species of the same genus.

Prof. August R. Grote, Director of the Museum of the Buffalo Society of Natural Science, stated that he believed the damage done by Paris green was greater than that done by the potato bug. His opinion was based on a careful study of its effects on horses, cattle, sheep, chickens, and even men and women. He referred to the laws in Germany restricting the open and promiscuous sale of such poisons, and thought it the duty of the members of the club to do all in their power toward educating the people up to the bad effect of this and kindred poisons, aniline dyes, etc., with a view to effecting legislation. Prof. Comstock presented specimens of an insect which preys on the eggs of the bark-louse, taken from the maple. Prof. C. V. Riley, of the United States Entomological Commission, gave an account of two species of moths affecting the yucca. Professor Samuel H. Scudder told of a fossil insect of a very singular shape, obtained from tertiary rocks. Prof. W. S. Barnard, of Cornell University, showed specimens of a small bug which kills bees and butterflies much larger than itself. He also gave an account of the pear bug-louse, which causes a certain blight to the pear tree. Prof. William Saunders, editor of the *Canadian Entomologist*, gave an account of insects he had seen caught by the bidens, not heretofore supposed to be a carnivorous plant.

New Theory of Sea Level Changes.

In an interesting article by Warren Upham, in the *American Naturalist*, on the "Formation of Cape Cod," in which he shows that it is due to glacial action, the author presents the following theory of the causes of the changes in sea levels:

The plains of Cape Cod are further like those of Long Island, Martha's Vineyard, and Nantucket, in being indented by narrow arms of the sea, which reach one to two miles inland, filling the lower end of long depressions that continue across the plains to the north, being either dry or occupied by small streams. The plains and valleys which thus generally border the terminal moraines on their south side appear to have been formed by the same floods which deposited the large amounts of modified drift along the edge of the ice sheet. Much of their finer gravel and sand was carried forward by the descending currents, and spread in these gently sloping plains, while the valleys of drainage seem to have been made by the same waters at their lower stages.

The continuation of these valleys below our present sea level calls up one of the most complex but at the same time most important and interesting questions connected with glacial geology. This feature shows plainly that when these valleys were formed the sea did not reach so high upon the land as now; and if we extend our inquiries we find that everywhere around the world the glacial period was marked by most extraordinary changes in the relative heights of land and sea. These remarkable oscillations, which had one extreme at the equator and the other at the poles, appear to have been changes in the level of the ocean. It seems not unlikely that an eighth part of the earth's surface had become covered with ice, and if we consider a slope of one half a degree to be needed to give it motion, an estimate of four miles for its average depth does not seem to be too great. The removal of the water thus taken from the sea and stored up in accumulations of ice would lower the surface of the ocean more than half a mile. At the same time this vast accumulation of ice in high latitudes must draw the sea by gravitation away from the equator toward the poles. This cause appears to have retained the sea level at about its present height near the lower limit of the ice sheet, while in arctic regions it rose much higher than now. Marine shells in the modified drift show that the sea thus stood fifty to two hundred feet above its present height on the coast of New Hampshire and Maine; five hundred feet in the valley of the St. Lawrence, and one thousand to two thousand feet higher than now along the west coast of Greenland. Everywhere in high latitudes, both in the northern and southern hemispheres, we have proof of such a submergence of the land when the drift was accumulated, increasing in amount the nearer we go to the poles. On the other hand, the coral islands of the tropics are witnesses of the depression of the sea in this period, amounting to three thousand feet, or perhaps more, at the equator, while different evidence shows that at the mouths of the Mississippi, Ganges, and Po rivers, it was at least four hundred feet lower than now. If we reflect upon these widespread changes of sea level that marked the glacial period, occurring only where they would be produced by taking water from the sea to form ice sheets and by gravitation through their influence, and if we compare these recent simultaneous changes with the general stability of the continents, we seem compelled to attribute them to movements of the sea rather than of the land.

Because of the attraction of accumulations of ice that still remain about the poles, where probably little or none existed in tertiary times and at the epoch immediately preceding the glacial period, the sea along the eastern coast of the United States appears to be lower now than during those periods, uncovering the tertiary border of the Southern States and leaving pre-glacial deposits with marine shells, apparently Post-pliocene, fifty to two hundred feet above our present sea level, under the terminal moraine and modified drift of Long Island. The entirely unstratified character which marks many portions of the terminal deposits of the ice sheet, reaching quite to the sea shore, and the still lower extension of the channels which appear to have been cut by the floods formed at its melting, indicate that at the south coast of New England the sea was depressed in the glacial period below its present height. The submarine channel of Hudson river shows that after this time it sank five or six hundred feet lower than now, apparently because the south part of the glacial sheet had been melted, greatly diminishing its attractive force at this latitude. With the more complete departure of the ice the sea level has been restored to approximately the same condition as before the glacial period, being still rising on the eastern coast of the United States at the rate of about a foot, or less, in a hundred years.

MISCELLANEOUS INVENTIONS.

Mr. Dabney C. T. Davis, of Greenwood, Va., has invented a light, cheap, and easily adjustable shade, that may be fitted to any style of hat, and removed at pleasure. It is designed for keeping off the rays of the sun and inducing a current of air to pass around outside of the hat and in contact with it in order to keep it cool.

Mr. William C. Egan, of New York City, has invented an improved fastening for ladies' and children's shoes, whereby the trouble and annoyance resulting from the use of buttons, lacings, or other devices may be avoided and the appearance of the shoe improved. The invention consists in providing a shoe with elastic insertion and alternating scalloped edges, provided with studs on the points for receiving a lacing.

A simple, easily adjusted, and efficient device for securing watch stems in the pendant, has been patented by Mr. George F. Dobiecki, of Brooklyn, N. Y. It consists of a pin passed through a hole made in the pendant, through the ears, and through the bushing, and engaging an annular groove or notch in the stem. Freedom of movement is allowed the stem; but it is held in the pendant unless released by withdrawing the pin.

An improvement in the construction of toe weights (or side weights), such as are used attached to horses' feet for inducing an increased tendency of the horse to throw his feet forward and increase his speed in trotting, or otherwise regulating the gait of horses, has been patented by Mr. Hope Redmon, Jr., of Cynthiana, Ky. The invention consists in a grooved weight, wedge shaped in the cross section, and provided with a spring catch, combined with a toothed clamping hook, having a shoulder and toe on its lower end, by which it is secured in a suitable rabbeted slot in the horse-shoe.

Mr. Isaac A. Powell, of Elk Falls, Kan., has patented improvements in the construction of apparatus for heating water for steaming feed, scalding hogs, and for laundry purposes. The water chamber is made of wood, and from the bottom over a central opening rises the fire chamber, the sides of which are corrugated to increase the heating surface without increasing its height beyond a safe point, and its top is covered by a concave or inverted conical crown, from which rises the flue pipe, which is carried through the top of the water chamber. The apparatus has a grated fire basket, adapted to fit up into the fire chamber, and it has an opening on one side for supplying fuel to the fire without removing the basket entirely from the fire chamber.

Mr. Lafayette Smith, of Millersburg, Ind., has invented an improved eaves trough hanger, which consists of a flat sheet metal bar, from which depends a perpendicular bar or rod whose lower end embraces a round or flat cross bar set horizontally across the trough and firmly secured thereto with solder.

Mr. Edmund R. Banks, of Cynthiana, Ky., has patented an improvement in coffee and tea pots, in which the construction is such that the coffee and tea can be steeped and the pots placed upon the table without its being necessary to strain the coffee and tea. The invention consists in the wire gauze cup suspended detachably from a hook attached to the cover of the pot.

An improvement in wisp brooms has been patented by Mr. James H. Flynn, of Schenectady, N. Y. This invention consists in fastening the under edge of the cap to the wisp by wrapping it with wire, and then drawing the cap up over the wire and fastening its upper edge by wrapped wire, which is concealed within the lower end of the handle. The handle is made of a paper tube wrapped or covered with velvet or other fabricated material adapted to fit over the wooden stock, to which it is secured by glue or tacks, etc., and a cap piece nailed to the upper end of the stock. It has a loop, the lower end of which is fastened under the lower edge of the handle, and its upper end under the cap piece.

An improved table for playing ball games has been patented by Messrs. Edwin M. Macy and Rufus Russell, of Longview, Texas. It consists of a bed, upon which the balls are rolled, having at the end spaces for the balls to pass through, and behind these a pit communicating with a return ball alley, also an elastic cushion, against which the balls strike.

An improved double-acting lift pump has been patented by Mr. William Loudon, of Superior, Neb. It consists in providing the upper end of the cylinder, on the outside, with a flange, to which the upper head is screwed or otherwise attached Through this flange are made water ways, through which the water passes upward to enter the cylinder.

The Juice of the Tomato Plant as an Insecticide.

A writer in the *Deutsche Zeitung* states that he last year had an opportunity of trying a remedy for destroying green fly and other insects which infest plants. It was not his own discovery, but he found it among other recipes in some provincial paper. The stems and leaves of the tomato are well boiled in water, and when the liquor is cold it is syringed over plants attacked by insects. It at once destroys black or green fly, caterpillars, etc.; and it leaves behind a peculiar odor which prevents insects from coming again for a long time. The author states that he found this remedy more effectual than fumigating, washing, etc. Through neglect a house of camellias had become almost hopelessly infested with black lice, but two syringings with tomato plant decoction thoroughly cleansed them.—*Gardener's Chronicle.*

The Sand Box Tree.

On the far side of the island (St. Thomas), says Mr. Moseley, I saw several "sand box trees (*Hura crepitans*). The tree is one of the Euphorbiaceæ, allied to our spurges, and has a poisonous, irritant juice; but its most remarkable peculiarity is its fruit. A number of seed capsules, shaped like the quarters of an orange, are arranged together side by side as in an orange, so as to form a globular fruit. When the fruit has become quite ripe and dry, suddenly all the capsules split up the back, opening with a strong spring, and the whole fruit flies asunder, scattering its seeds for a distance of several yards, and making a noise like the report of a pistol.

The Boomerang.

This curious weapon, peculiar to the native Australian, has often proved a puzzler to men of science. It is a piece of carved wood, nearly in the form of a crescent, from 30 to 40 inches long, pointed at both ends, and the corner quite sharp. The mode of using it is quite as singular as the weapon. Ask a black to throw it so as to fall at his feet, and away it goes full 40 yards before him, skimming along the surface at 3 or 4 feet from the ground, when it will suddenly rise in the air 40 or 60 feet, describing a curve, and finally drop at the feet of the thrower. During its course it revolves with great rapidity, as on a pivot, with a whizzing noise. It is wonderful so barbarous a people should have invented so singular a weapon, which sets laws of progression at defiance. It is very dangerous for a European to try to project it at any object, as it may return and strike himself. In a native's hand it is a formidable weapon, striking without the projector being seen; like the Irishman's gun, shooting round a corner equally as well as straightforward. An engraving of one of these curious implements was published in these columns some time ago.

The Objects of Study.

The duties of the teacher are tersely set forth in the New York *School Journal* as follows:

His business is to develop, discipline, and train the powers by which knowledge is gained; besides, in performing this work he will lodge in a secure and usable form all the useful knowledge possible. He will make as his great leading object the training of the mind; he will next direct the pupil's attention to his own mental processes, to show him when he thinks accurately; this is sometimes called *teaching to think;* he will teach the pupil to arrange and classify his knowledge; he will teach the pupil to give good expression to his knowledge. These being the objects the teacher aims at, he requires study in order that he may secure these objects; they may be set down as the objects of study. And if a person has no teacher, he still needs all of the above effects, and to produce them he uses study. It is plain, then, that study is the indispensable means to be employed to obtain education.

SCIENTIFIC EDUCATION.—It would certainly be a great boon to the world if the general level of scientific education could be raised, so that each young man or young woman, when he or she issues from school doors, should have enough definite knowledge of the great laws of the physical universe to instantly denounce blue glass theories and attempts at perpetual motion, not from the pride of knowledge, but from the feeling that error, credulity, and superstition should be combated with truth.—*Prof. John Trowbridge.*

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Huxley on Pluck and Endurance.

At the distribution of prizes for proficiency in intellectual and physical exercises, at University College, London, recently, Professor Huxley spoke to the boys, dwelling especially upon the value of industry and physical capacity for hard work in the competition of every-day life. The chief value of their success in school lay, he said, in the evidence it afforded of the possession of those faculties which would enable them to deal successfully with those life conditions they were about to meet. Asking what sort of fellows were the prize winners, he continued:

Is there, in all the long list which we have gone through to-day, the name of a single boy who is dull, slow, idle, and sickly? I am sorry to say that I have not the pleasure of knowing any of the prize winners this year personally—but I take upon myself to answer, Certainly not. Nay, I will go so far as to affirm that the boys to whom I have had the pleasure of giving prizes to-day, take them altogether, are the sharpest, quickest, most industrious, and strongest boys in the school. But by strongest I do not exactly mean those who can lift the greatest weights or jump furthest—but those who have most endurance. You will observe again that I say take them altogether. I do not doubt that outside the list of prize winners there may be boys of keener intellect than any who are in it, disqualified by lack of industry or lack of health, and there may be highly industrious boys who are unfortunately dull or sickly, and there may be athletes who are still more unfortunately either idle or stupid, or both. Quickness in learning, readiness, and accuracy in reproducing what is learnt, industry, endurance—these are the qualities, mixed in very various proportions, which are found in boys who win prizes. Now there is not the smallest doubt that every one of these qualities is of great value in practical life. Upon whatever career you may enter, intellectual quickness, industry, and the power of bearing fatigue are three great advantages. But I want to impress upon you, and through you upon those who will direct your future course, the conviction which I entertain that, as a general rule, the relative importance of these three qualifications is not rightly estimated, and that there are other qualities of no less value which are not directly tested by school competition. A somewhat varied experience of men has led me, the longer I live, to set the less value upon mere cleverness; to attach more and more importance to industry and to physical endurance. Indeed, I am much disposed to think that endurance is the most valuable quality of all; for industry, as the desire to work hard, does not come to much if a feeble frame is unable to respond to the desire. Everybody who has had to make his way in the world must know that while the occasion for intellectual effort of a high order is rare, it constantly happens that a man's future turns upon his being able to stand a sudden and heavy strain upon his powers of endurance. To a lawyer, a physician, or a merchant it may be everything to be able to work sixteen hours a day for as long as is needful without knocking up. Moreover, the patience, tenacity, and good humor, which are among the most important qualifications for dealing with men, are incompatible with an irritable brain, a weak stomach, or a defective circulation. If any one of you prize-winners were a son of mine (as might have been the case, I am glad to think, on former occasions), and a good fairy were to offer to equip him according to my wishes for the battle of practical life, I should say, "I do not care to trouble you for any more cleverness; put in as much industry as you can instead; and oh, if you please, a broad, deep chest, and a stomach of whose existence he shall never know anything." I should be well content with the prospects of a fellow so endowed. The other point which I wish to impress upon you is, that competitive examination, useful and excellent as it is for some purposes, is only a very partial test of what the winners will be worth in practical life. There are people who are neither very clever nor very industrious, nor very strong, and who would probably be nowhere in an examination, and who yet exert a great influence in virtue of what is called force of character. They may not know much, but they take care that what they do know they know well. They may not be very quick, but the knowledge they acquire sticks. They may not even be particularly industrious or enduring, but they are strong of will and firm of purpose, undaunted by fear of responsibility, single-minded, and trustworthy. In practical life a man of this sort is worth any number of merely clever and learned people. Of course I do not mean to imply for a moment that success in examination is incompatible with the possession of character such as I have just defined it, but failure in examination is no evidence of the want of such character. And this leads me to administer from my point of view the crumb of comfort which on these occasions is ordinarily offered to those whose names do not appear upon the prize list. It is quite true that practical life is a kind of long competitive examination, conducted by that severe pedagogue, Professor Circumstance. But my experience leads me to conclude that his marks are given much more for character than for cleverness. Hence, though I have no doubt that those boys who have received prizes to-day have already given rise to a fair hope that the future may see them prominent, perhaps brilliantly distinguished, members of society, yet neither do I think it at all unlikely that among the undistinguished crowd there may lie the making of some simple soldier whose practical sense and indomitable courage may save an army led by characterless cleverness to the brink of destruction, or some plain man of business, who, by dint of sheer honesty and firmness, may slowly and surely rise to prosperity and honor when his more brilliant compeers, for lack of character, have gone down, with all who trusted them, to hopeless ruin. Such things do happen. Hence, let none of you be discouraged. Those who have won prizes have made a good beginning; those who have not may yet make that good ending which is better than a good beginning. No life is wasted unless it ends in sloth, dishonesty, or cowardice. No success is worthy of the name unless it is won by honest industry and brave breasting of the waves of fortune. Unless at the end of life some exhalation of the dawn still hangs about the palpable and the familiar—unless there is some transformation of the real into the best dreams of youth—depend upon it, whatever outward success may have gathered round a man, he is but an elaborate and a mischievous failure.

Blowing Up River Snags.

Mr. R. R. Hunt describes, in the *Transactions of the New Zealand Institute*, the method practiced on the Waikato River to remove the snags which obstruct the navigation and have repeatedly led to the wrecking of river craft. The Waikato Steam Navigation Company, the main sufferer, determined to use dynamite for clearing away the obstructions. The work, as far as the dynamite was concerned, was of the ordinary character, but two special provisions were adopted in the preliminary operations. First, a boat was secured by double moorings above the site of the snag, so that by paying out the moorings the boat could be suffered to drop down stream exactly over the snag; second, for examining the stump, use was made of what has been called a "hydraulic telescope," viz., a plain wooden tube with a piece of glass at the bottom, and two handles, by which the tube could be held steadily to the eye. By the aid of this instrument the snag could be clearly seen, and the best part for boring the hole could be chosen. This was an important point, as if, in the absence of the power of selection, the hole was accidentally bored into a wrong part of the snag, the dynamite was practically wasted, the due effect being only felt when the hole was made in a sound part of the timber.

The inspection having been made, a hole was bored with a 1½ inch steel auger to a depth of 3½ feet below the summer level of low water. A charge of dynamite, varying from 3 ounces to 24 ounces, was then inserted and exploded by a fuse. As soon as the fuse was lighted the ropes were hauled on and the boat drawn up stream some 50 feet, which was found in all cases sufficient to protect the occupants from injury on the explosion taking place. Then the ropes were paid out to the same length as before, and in this way, with the use of two ropes, the boat was certain to return to the exact spot it had previously occupied. This was an important matter in saving time, as it was difficult to discover through the rippling water the exact site of the snag, which it was necessary to revisit in order to ascertain whether or not the charge had done its work. It was found to be false economy to use too little dynamite, as the explosion then only shattered the stump, and a second operation necessitated double or treble the amount to clear it away entirely. As a rule, half a pound of dynamite was required for a stump 2 feet in diameter; but a snag 4 feet in diameter was only removed by a charge of 1½ pounds. It was remarked that the stumps were invariably cut off at the bottom of the auger hole, leaving a flat surface, as from a cross-cut saw, and it has been suggested that a similar mode of felling large trees would save many serious accidents to the men employed. The cost of blowing up a snag by dynamite is about one third of that required for removing it by sawing. On an average three men will blow up eight snags a day.

Inefficiency of Steel Armor Plates.

A series of experiments were commenced recently at La Spezzia, Italy, in the presence of Herr Krupp, the representatives of the Terre Noire Works, and others, to test the resistance of steel armor plating against a 100-ton Armstrong gun, and the respective merits of the projectiles furnished by Armstrong, Gruson, Whitworth, Terre Noire, and San Vito. Two projectiles were to be fired against each of four Terre Noire plates, 9 feet by 4 feet 8 inches, and 2 feet 4 inches thick, at a distance of 500 feet from the gun. The two best were to be tried against the steel furnished by Saint Chamond. The terrible efficiency of the projectiles first tried thwarted these arrangements.

The first round was fired with a projectile (San Vito) from the government manufactory of Fossano, made of chilled Gregorini cast iron, weighing 2,022 pounds, the charge being 550 pounds of powder. The shell was projected with the velocity of 1,715 feet per second. It struck the target and rebounded, and shivered in pieces, after piercing the plate to a depth of 14 inches and carrying away a third of it. The second round was fired with a Whitworth projectile weighing 2,110 pounds, made of compressed steel, with a hardened point 3 inches long. The steel pierced the plate 22 inches, and carrying away a third of it, passed through the backing, remaining itself almost intact. The third round was fired with an Armstrong projectile weighing 1,946 pounds. The steel penetrated the plate 12 inches, completely shattering and dislodging it, and rendering the target unfit for further practice, but failing to penetrate the backing. Although a government commission on the subject has not reported its opinion, the general conviction is that these experiments fully proved the utter inefficiency of steel plates for defensive purposes.

New Discovery in Connection with Carbolic Acid.

BY JOHN DAY, M.D.

Several important additions have recently been made to our knowledge of the chemistry of carbolic acid, some of which are possessed of great interest to us as medical practitioners. For instance, Städeler has shown that it is a constant constituent of the urine; Brieger has shown that it is a normal constituent of the contents of the bowels; and Baumann has discovered that it is one of the products of the putrefaction of albumen. For an interesting account of these and other discoveries in connection with carbolic acid, I would beg to refer you to an editorial article in the *Medical Times and Gazette*, of October 12, 1878, entitled "The Pathological Excretion of Carbolic Acid." I have myself devoted a good deal of attention to the chemistry of carbolic acid, and in the course of my investigations have found that it is a powerful deoxidizing agent—a property which has not, that I am aware of, been previously recognized.

I will show you a few experiments by way of proving that my view on this point is correct. Guaiacum resin, when oxidized, is changed from its normal color, which is reddish brown, to a deep blue, and this effect can be produced by a number of oxidizing substances. I have chosen, as sufficient for my purpose, solution of permanganate of potash, black oxide of manganese, tincture of iodine, and the vapor of a solution of chlorine. I will now oxidize some guaiacum resin with the different substances I have named, and then deoxidize it and restore it to its normal color by the addition of carbolic acid. That this is simply a process of deoxidation may be shown by the ease with which the guaiacum can be again oxidized. I can offer you another proof of the deoxidizing power of carbolic acid by adding a drop or two to a solution of permanganate of potash, when you will find that it will be instantly reduced and decolorized.

I will show you one more experiment in proof of the deoxidizing properties of carbolic acid, and it is one which I think will interest you, as it is a little suggestive of the action of carbolic acid on the iron in the blood, when it is administered internally. This bottle contains a weak solution of persulphate of iron, and to show you that it does not contain a trace of the protosulphate I will add a few drops of a solution of red prussiate of potash, a salt which has no action on persulphate of iron, but quickly turns the protosulphate blue. By the use of this test we have not, as you may perceive, produced any change of color in the solution; but on the addition of a little carbolic acid you will find that a deep blue reaction will occur, thus showing that the persalt of iron has been reduced to a protosalt.

If you will permit me to trespass on your time for a few minutes longer, I will show you a very curious reaction which carbolic acid is capable of effecting, and it is one which has not yet, I think, been mentioned in any work on chemistry. When carbolic acid is added to tincture of iodine no perceptible change takes place, but when carbolic acid is added to tincture of iodine freely diluted with water, the fluid is almost instantly decolorized, and a compound is formed which is incapable of acting on starch and turning it blue as free iodine does. Now, it has struck me that this combination of carbolic acid and iodine might form a good antiseptic dressing for wounds. Indeed, the main object of my paper has been to excite a discussion on a theory I wish to place before you regarding the action of carbolic acid as an antiseptic.

The investigations of Pasteur, Tyndall, Sanderson, Lister, and others, have clearly shown that putrefactive changes never take place without the presence of bacteria; and, further, that bacteria are dependent on oxygen for their existence. Now, it has occurred to me that the deoxidizing properties of carbolic acid offer a fair explanation of its *modus operandi* in the antiseptic treatment of wounds. During the reading of this paper Dr. Day demonstrated by several experiments the correctness of his conclusions.—*Australian Medical Journal.*

The Music of the Spheres.

Light comes in undulations to the eye, as tones of sound to the ear. Must not light also sing? The lowest tone we can hear is made by 16·5 vibrations of air per second; the highest, so shrill and "fine that nothing lives 'twixt it and silence," is 38,000 vibrations per second. Between these extremes lie eleven octaves; C of the G clef having 258⅞ vibrations to the second, and its octave above 517½. Not that sound vibrations cease at 38,000, but our organs are not fitted to hear beyond those limitations.

If our ears were delicate enough, we could hear even up to the almost infinite vibrations of light. Were our senses fine enough, we could hear the separate keynote of every individual star. Stars differ in glory and in power, and so in the volume and pitch of their song. Were our hearing sensitive enough, we could hear not only the separate keynotes, but the infinite swelling harmony of these myriad stars of the sky, as they pour their mighty tide of united anthems in the ear of God.—*Rev. H. W. Warren, Recreations in Astronomy.*

THE preserving of fruits, vegetables, etc., is an industry of very large proportions in this country, and the processes of manufacture have become so perfected there is but very little material wasted. The skins of the fruit are converted into jellies; the peach stones are sold to druggists; the tomato peelings and the very scrapings of the table go to the catchup makers. The entire process of desiccation occupies about three hours.

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AN ASCENT OF THE VOLCANO OF AGUA, CENTRAL AMERICA.

M. P. de Thiersant, *Chargé d'Affaires* of France at Guatemala, communicates to *La Nature* the following narrative of a recent ascent made by him of the celebrated volcano of Agua, which, within the historic period, has emitted only water, but that occasionally with disastrous consequences:

I started from Guatemala on the 16th of February, 1879, with my wife, Mr. Graham, the British *Chargé d'Affaires*, and Captain Gaillardo, aid-de-camp to President Barrios.

After a night's rest we again took up our route, accompanied by an escort of 20 Indians. At half past 11 o'clock we entered the city of Antigua, the unfortunate victim of an earthquake in 1773, and which has never since risen from its ruins. There we found the provisions that we had ordered in advance, as well as a supply of horses and some new traveling companions—a French gentleman, M. Coupé, and a Guatemalian lieutenant. At 2 o'clock we mounted our horses and proceeded toward Santa Maria, following, as far as San Juan del Obispo, the valley of Antigua, which is covered with coffee and corn plantations. We then began the ascent by a road cut out of a mass of ashes and *lapille* (lava gravel), the numerous strata of which marked the ancient eruptions of the volcano. At 4 o'clock we perceived the ranchos of Santa Maria, a large town inhabited entirely by Cokchiquel Indians, who speak the Populuka language. The plain on which they have established themselves is 6,800 feet above the sea level, undulating in character, and covered with volcanic deposits, which are utilized in the culture of coffee, corn, and sugar cane.

As soon as our presence was known a large number of them, men, women, and children, ran to meet us, and accompanied us as far as the door of the *cabildo* (town house), the two halls of which were kindly put at our disposal by the alcade of the place. At half past 3 o'clock in the morning the caravan again moved, preceded by a drummer, a fifer, and a lantern bearer, the 20 Indians bringing up the rear. The night was quite dark, though starlight, and the air was filled with cold mists which covered the plain. After having got beyond the houses of the town we reached the side of the cone, the inclination of which allowed us to make our way easily, although slowly. Then, taking our steed by the bridle, we followed a path which led us to the clearing called *La Crux* (The Cross), and which we reached at a quarter past 5 o'clock. The thermometer marked 5·80° C. (42° F.); we were at an altitude of 8,500 feet. To preserve us from the effects of the cold, which was quite acutely felt, the Indians lighted a large fire, and seated around this we patiently awaited the dawn of day. At thirty-five minutes past 5 we again took up our march, leaving our horses in charge of some of the Indians, and penetrated the forest by a path inclined at an angle of about 28 to 30 degrees. After walking for an hour we entered the region of conifers, and struck the boundary of the forest, which is at an altitude of about 10,000 feet. From this limit onward the ascent was really painful and difficult. The path ran through the midst of thickly tufted plants, 15 to 20 inches high, which are used by the Indians for covering their ranchos.

Walking was at first quite easy, although the soil was very slippery on account of its clayey nature; as yet the grade was only 30 to 35 degrees, but little by little it became steeper, until it was, if I am not mistaken, fully 45 degrees.

At an altitude of 10,170 feet we turned to the right, and for some time followed the ravine through which rushed the torrent of water that, in 1541, destroyed the city of Ciudad-Vieja. Afterward we turned again to the left, and proceeded directly northward toward the slope of the volcano, which seemed to recede in proportion as we approached it. At an altitude of 10,500 feet we began to meet, at various distances apart, small glaciers, called *neverias*, in the hollows of the mountains, and from which the Indians obtain the ice which they sell to the inhabitants of Antigua. One of the curious facts that we observed was that from the beginning of the forest as far as the volcano the surface of the soil, protected from the rays of the sun, was covered with ice some millimeters thick, and it remains in this state, although the mean temperature of 0° C. (32° F.) occurs at a much higher altitude than this.

Another fact observed was that, in proportion as we ascended, the pines became more stunted and less numerous, all those that we noticed being half charred and bearing the traces of lightning or of fire. The aspect of these blackened and leafless pines, scattered here and there about 30 feet apart, only added to the desolate appearance of the desert through which we were desirous of hastening. Unfortunately, this last part of the ascent was the most toilsome; the rarefaction of the air, added to the steepness of the mountain, obliged us to ascend slowly in order that we might breathe. Finally, after painful efforts, we reached the volcano at half past seven.

FORMER ERUPTIONS OF THE VOLCANO.

The volcano of Agua once destroyed an entire city, not with torrents of fire and lava, but with an avalanche of water which had gathered within its walls. This fearful catastrophe is thus narrated by the historian Juarros:

"The most awful calamity which had as yet afflicted this unfortunate city (Guatemala) took place on the morning of the 11th of September, 1541. During the three days preceding there had been an incessant and violent rain, particularly during the night of the 10th, and the water seemed to fall rather like a cataract than a mere rain. It is impossible to describe the fury of the wind, the perpetual flashes of lightning, and the fearful roar of the thunder. On the morning of the 11th, at 2 o'clock, the quaking of the earth was so violent as to make it impossible for any one to remain standing; and the shocks were accompanied by subterranean noises which caused a general terror. Soon afterward an immense torrent of water was precipitated from the summit of the mountain, carrying along with it enormous quantities of rocks and gigantic trees. It descended exactly upon the unfortunate city, destroying almost all the houses, and burying a large number of the inhabitants beneath the ruins, and among others Doña Beatrice de la Cueba, the widow of Pedro Alvardo, the illustrious conqueror."

PRESENT ASPECT OF THE CRATER.

The crater which contained this volume of water, and which is to-day perfectly dry, is about circular in outline and funnel-shaped, its diameter at the top being 625 to 650 feet, and at the bottom 312 feet. Its depth does not exceed 312 feet. Its sides are composed of solid rock, in some places forming an unbroken wall, and at others piled up in immense blocks; they are inclined at a steep angle, especially at the east and west, and strewn with stunted pines. The bottom of the crater is level and composed of a clayey soil, overgrown with a small grass, along with which are found a few myrtaceous plants of a species which also grows on the sides of the mountain. At the base of the chasm are found, lying pell-mell, large blocks of stone that have fallen from the summit, and upon which are seen several names written, with the dates 1550, 1553, etc. At some parts of the walls and the upper edge are seen manifest traces of an ancient eruptive activity, which, with the enormous deposits of igneous dejections accumulated at the foot of the mountain, indicate that the volcano of Agua was formerly ignivomous, although there now exists neither history nor tradition of such eruptions.

After visiting the bottom of the crater, I ascended and made the tour of its summit. The ascent is quite difficult, and even dangerous. One is obliged to climb over blocks of rocks, and in certain places the passage is so narrow that great care is necessary. The highest point is at an altitude of 12,500 feet. MM. Dolfus and Montferrat made it 12,300, Father Cornet 12,400, and Cervantes 13,800. It took us more than an hour to make the circuit of the edge of the volcano. But what a magnificent panorama we enjoyed from the top of this observatory, placed by nature at a very short distance from the summit line! In its entirety, the view embraced the whole Republic of Guatemala, a portion of that of Salvador, and extended to the Atlantic and Pacific, whose immense blue sheets were confounded with the horizon. As details of this splendid picture, probably unique in the world, we observed on one side the volcano of Fuego, with its immense plume of smoke; on the other, the green plains of Escuintha, whose tints, diminishing by imperceptible degrees, finally disappeared in the billows of the ocean; the great lake of Amatitlan, whose green shade was relieved by the sugar cane plantations which surrounded it; further off, the naked and ragged summits of the provinces of Altos, surrounding the picturesque lake of Aititlas like a crown; and, finally, shut off in the distance by the high mountains of Vera Paz, the laughing valleys of Antigua and Guatemala, with their fields of coffee and maize, and their collections of houses forming villages and cities. In the midst of these marvels of nature the only sad thing is to see that the hand of man has as yet done hardly anything to reap any benefit from them.

Russian Fairs at Nijni-Novgorod.

A cable telegram a few days ago announced that, during the annual fair at Nijni-Novgorod, a fire broke out which consumed several of the booths. Nijni is on the Volga, very near the center of European Russia, and has direct railway connection with Odessa, Moscow, and St. Petersburg, where merchants take an active interest in the annual fairs. The business in furs and skins forms an important part of the transactions at these gatherings. A correspondent writes to the *Shoe and Leather Reporter* as follows respecting the fair and the methods of doing business:

"At Nijni the summer days are generally hot, and the nights seldom darken into anything deeper than a silvery gray twilight. The sun rises early, and by five o'clock all the travelers are up and pouring into the public houses, where they breakfast off tea mixed with spirits, raw ham, cold sausages, and other such light trifles. Then the business of the day commences, to end virtually at eleven o'clock, for by that time all the important sales have been effected, and the rest of the day is given over to napping, dining, and festivities. The booths of Nijni may be counted by the thousand, stretching from the center of the town through all the principal streets in every direction, and out into the suburbs; but for the convenience of traders the different wares are classed together—the jewelers near the Starostat House, close under the eyes of the police; the silks and cloths a little further; then the hardware, and so on. Out into the suburbs, where their fragrancy may blend with that of the country air, are the skinners' stalls, whose goods are of powerful perfume.

"The Russians haggle a good deal over their bargains—not with screams like the Greeks, nor with disdainful shrugs like the Turks, but with fawning and persuasive banter. The graver Russian merchants do their bargaining with a solemn brevity of speech, but they have none the less a reputation for being sly customers. Chroniclers are in doubt as to whether it is the Russian or the Chinese who is hardest to beat in business; at any rate, the Russian is so incredulous of other men's honesty that he mostly keeps his own hidden like a precious coin, only to be exchanged for a full equivalent. There is no such thing as buying a pile of skins at sight and trust in Nijni; every skin must be overhauled, and if the slightest flaw be apparent it must be exchanged for a better one. This system, applied to other goods besides skins, makes business a little slow, and explains the fact that not much money changes hands, though there is much fussing in the booths."

Krupp of Essen.

The cast steel manufactory at Essen has existed since 1810. It has been conducted by the present owner, Herr Alfred Krupp, since 1826, and since 1848 for his sole account. The number of workmen at the close of 1877 amounted to 8,500. There are in these works 1,648 furnaces, 77 steam hammers, the largest of all weighing 50 tons, 18 trains of rolls, and 1,063 machine tools. One of the steam engines at Essen is 1,000 horse power. When all existing facilities are employed the works can produce in 24 hours 2,700 rails, which will lay 11⅞ miles of line, 350 tires, 150 locomotives and car axles, 180 car wheels, 1,000 railroad springs, 1,500 grenades, etc. In one month there can be produced 304 field guns and guns of large caliber. At the various works of Herr Krupp there were also employed 5,300 workmen in addition to those already enumerated. The mines attached to the works embrace 4 coal mines and 562 iron ore mines, including iron mines near Bilbao, in Spain. Four large steamers owned by the works, each of 1,700 tons burden, besides leased steamers, are engaged in the transportation of Spanish ores to Krupp's furnaces on the Rhine. Another steamer, of 1,000 tons burden, is being constructed.

Wheat Raising in the South.

The Macon *Telegraph* announces that for the first time in the history of Georgia the local mills find wheat in sufficient abundance to run them without drawing supplies of wheat from the North. There are, undoubtedly, parts of Central Georgia where wheat can be grown to perfection, for there the soil is a stiff clay loam, and is rich in the elements that wheat requires. But even upon the sandy soils of that State it appears that good wheat crops can be raised by the application of fertilizers, and if care be taken in the tillage. It seems to be a remarkable thing that in such soils wheat should be grown, as the *Telegraph* states, as far south in Georgia as the Florida line. This success has been achieved by the use of the drill. Nor is it only in Georgia that the cultivation of wheat is extending. In Northwestern South Carolina the Germans have demonstrated that excellent crops of both wheat and rye can be raised by deep drilling and manuring with the waste of the barnyard composted with muck and pine shatters.

How to Save Clover Seed.

One of our best clover seed savers is just at our elbow, and he says: "Tell them the second crop is for the seed, and is really fit for no other purpose, as it salivates the stock fed on it; that the best time to cut for seed is a very nice point to determine. It should be cut when a majority of the heads turn brown, and before any begin to shed off the little seed pods, each of which contains a seed. Cut the second crop of clover just as though it were for hay, rake it into windrows, and let it lie and take one or two showers; then put it into very small cocks while damp, about one good pitchforkful in a place, and when it is dry put into stacks and cap with something that will turn water; or what is still better, if you have a shed or barn, put it there and let it remain until you get a huller to take it out for you. There are hullers enough now in the State to hull all the seed needed for home use, and the owners of the hullers are willing and anxious to go to any section where work can be had. Let our farmers save all the clover seed they can, and thus help to make thousands of dollars for the State, now sent out each year for clover seed to sow."—*Rural Sun.*

Staining Pine.

The *Northeastern Lumberman* recommends the following manner of staining pine to represent black walnut: Put pulverized asphaltum into a bowl with about twice its bulk of turpentine and set where it is warm, shaking from time to time until dissolved; then strain and apply with either a cloth or a stiff brush. Try a little first, and if the stain be too dark, thin it with turpentine. If desirable to bring out the grain still more, give a coat of boiled oil and turpentine. When the wood is thoroughly dry, polish with a mixture of two parts shellac varnish and one part boiled oil. Apply by putting a few drops at a time on a cloth and rubbing briskly over the wood.

Pneumatic Cushion for Elevators.

An apparatus has been put into practical use in Chicago by the inventor, Colonel A. C. Ellithorpe, and subjected to serious tests in the Chamber of Commerce, where the elevator car, which itself weighed two tons, was loaded with 5,000 lb. of iron, and, to test the real merits of the invention, a basket of eggs and some glass globes; the car was then dropped from a height of forty feet, and was checked so gradually by the air at the bottom of the shaft that neither an egg nor a globe was broken. This encouraged two men to drop with the car, and they reached the bottom not only in safety, but almost unshaken.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

The best results are obtained by the Imp. Eureka Turbine Wheel and Barber's Pat. Pulverizing Mills. Send for descriptive pamphlets to Barber & Son, Allentown, Pa.

Wanted—The address of Manufacturers of Friction Clutches. Address Washington Ice Company, 79 Clark St., Chicago, Ill.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Patent Steam Cranes. See illus. adv., page 158.

Wanted—An offer to furnish Paper Tape for printing telegraph instruments in large quantities. Apply by letter to Wm. H. Deane, 196 Fifteenth St., B'klyn, N. Y.

The Secret Key to Health.—The Science of Life, or Self-Preservation, 300 pages. Price, only $1. Contains fifty valuable prescriptions, either one of which is worth more than ten times the price of the book. Illustrated sample sent on receipt of 6 cents for postage. Address Dr. W. H. Parker, 4 Bulfinch St., Boston, Mass.

A well equipped Machine Shop desire to manufacture special machinery. Address T. H. Muller, care of P. O. Box 532, New York.

The Baker Blower runs the largest sand blast in the world. Wilbraham Bros., 2318 Frankford Ave., Phila., Pa.

Cut Gears for Models, etc. (list free). Models, working machinery, experimental work, tools, etc., to order. D. Gilbert & Son, 212 Chester St., Philadelphia, Pa.

Wanted.—A first-class Machinist or Millwright familiar with hard wood working machinery; one who has had charge of men preferred. Give age, nativity, and experience. Address, with reference, Cincinnati Cooperage Company, Cincinnati, O.

Magnets, Insulated Wire, etc. Catalogue free. Goodnow & Wightman, 176 Washington St., Boston, Mass.

Inexhaustible Beds of Kaolin or Clay.—Wanted experienced pottery men to take an interest in the white, pink, and yellow kaolin beds. Digging and shipping on cars will cost 50 cents per ton. M. J. Dobschutz, Belleville, Ill., Agent.

Forsaith & Co., Manchester, N. H., & 213 Center St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

Wright's Patent Steam Engine, with automatic cut-off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

H. Prentiss & Co., 14 Dey St., New York, Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

The Horton Lathe Chucks; prices reduced 30 per cent. Address The E. Horton & Son Co., Windsor Locks, Conn.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Linen Hose.—Sizes: 1½ in., 20c.; 2 in., 25c; 2½ in., 29c. per foot, subject to large discount. For price lists of all sizes, also rubber lined linen hose, address Eureka Fire Hose Company, No. 13 Barclay St., New York.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Steam Yacht for sale. G. F. Shedd, Waltham, Mass.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

$300 Vertical Engine, 25 H. P. See illus. adv., p. 158.

Eclipse Portable Engine. See illustrated adv., p. 157.

Bradley's cushioned helve hammers. See illus. ad. p. 142.

Band Saws a specialty. F. H. Clement, Rochester, N. Y.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Noise-Quieting Nozzles for Locomotives and Steamboats. 50 different varieties, adapted to every class of engine. T. Shaw, 915 Ridge Avenue, Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

New 8½ foot Boring and Turning Mill for sale cheap. A first class tool. Hilles & Jones, Wilmington, Del.

The New Economizer, the only Agricultural Engine with return flue boiler in use. See adv. of Porter Mfg. Co., page 78.

Sawyer's Own Book, Illustrated. Over 100 pages of valuable information. How to straighten saws, etc. Sent free by mail to any part of the world. Send your full address to Emerson, Smith & Co., Beaver Falls, Pa.

Fuller & Stillman, Chemical Engineers and Assayers, 40 Broadway, New York.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus'd adv. p. 30.

The genuine Asbestos Roofing forms the lightest and most economical roof in use. It can be easily applied by any one. H. W. Johns M'f'g Co., 87 Maiden Lane, New York, sole manufacturers.

No gum! No grit! No acid! Anti-Corrosive Cylinder Oil is the best in the world, and the first and only oil that perfectly lubricates a railroad locomotive cylinder, doing it with half the quantity required of best lard or tallow, giving increased power and less wear to machinery, with entire freedom from gum, stain, or corrosion of any sort, and it is equally superior for all steam cylinders or heavy work where body or cooling qualities are indispensable. A fair trial insures its continued use. Address E. H. Kellogg, sole manufacturer, 17 Cedar St., New York.

Vertical and Horizontal Engines M'f'd by Nadig & Bro., Allentown, Pa.

Renshaw's Ratchet (short spindle) uses taper and square shank drills. Pratt & Whitney Co., Hartford, Ct.

Deoxidized Bronze. Patent for machine and engine ournals. Philadelphia Smelting Co., Phila., Pa.

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburg Steel Casting Company, Pittsburg, Pa.

The new "Otto" Silent Gas Engine is simple in construction, easy of management, and the cheapest motor known for intermittent work. Schleicher, Schumm & Co., Philadelphia, Pa.

Machines for cutting and threading wrought iron pipe a specialty. D. Saunders' Sons, Yonkers, N. Y.

Steam Engines, Automatic and Slide Valve; also Boilers. Woodbury, Booth & Pryor, Rochester, N. Y. See illustrated advertisement, page 29.

NEW BOOKS AND PUBLICATIONS.

SCIENTIFIC HORSESHOEING. By William Russell, Cincinnati: Robert Clarke & Co. 8vo, pp. 144. Price $1.00.

An unpretending yet superior treatise on this important art, embodying the results of over 40 years of study and intelligent practical working as a horseshoer and manufacturer of horse shoes for general and special use. The anatomy, functions, and proper management of the horse's foot are described in a plain, straightforward manner, with fifty engravings showing the hoof in health and disease, normal and special forms of shoes, and kindred matters of value to farriers and horse owners.

INTEMPERANCE THE GREAT SOURCE OF CRIME. By A. B. Richmond, Esq. Meadville, Pa.: H. M. Richmond. Price $1.50.

These "Leaves from the Diary of an Old Lawyer," as the sub-title describes them, embody an uncommonly cogent argument against the license system. The stories are well told and free from rant. Indeed its manly tone and temperate style are somewhat exceptional in "temperance" literature.

THE SILK GOODS OF AMERICA. By Wm. C. Wyckoff. New York: D. Van Nostrand.

There is no industry that is rising more steadily or more deservedly in popular favor than American silk manufacture. Mr. Wyckoff's brief account of the recent improvements and advances of this art in the United States is well calculated to help on the good work by showing the conditions which have determined the superiority of American silk goods. In addition to a dozen chapters on the manufacture and special characteristics of the several sorts of silk goods, the volume contains the Seventh Annual Report of the Silk Association of America, summarizing the progress made during the past year, and a directory of American silk manufacturers and dealers, and raw silk importers and brokers.

JOURNAL OF THE CINCINNATI SOCIETY OF NATURAL HISTORY. April, 1879.

With the present number, this excellent periodical—the organ of one of our most energetic natural history societies—enters upon its second volume. Its contents, as usual, are of great scientific interest, especial prominence being given, as in former numbers, to the subject of silurian palæontology. Professor A. G. Wetherby remarks at some length on the genus pterotocrinus; Mr. E. O. Ulrich describes three new genera and twenty-eight new species of fossils from the lower silurian about Cincinnati; Mr. S. A. Miller remarks upon the Kaskaskia group, and describes four new species of fossils from Pulaski county, Ky.; and Mr. Joseph F. James gives a catalogue of plants growing in the vicinity of Cincinnati. The latter is rendered doubly valuable from the fact of its containing a reproduction of Lea's list of Cincinnati fungi, which has been long out of print. Considering the number of botanists in the United States who have entered, or are entering, upon the study of mycology, the Cincinnati Society would be doing a great service to science if it would supplement this bare list of fungi by a reprint of the descriptions of new species as given by Mr. Berkeley in the now inaccessible Lea catalogue. We know of but a single copy of the latter rare pamphlet in New York city, and that is buried in a volume with other papers, where it would never be found by a student unless by accident.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) W. B. C. asks: Is there anything that will remove tincture of iron from clothes? A. Try pure hydrochloric acid diluted with its own volume of water, and rinse with plenty of water afterwards and then with a small quantity of dilute ammonia water.

(2) A. D. E. asks: Do you consider crude petroleum of any benefit in keeping a boiler clean where hard water is used? If good to use, how often and in what quantities and in what manner should it be used? A. In moderate quantity, and when properly used, petroleum has been found useful in preventing the formation of hard incrustations in boilers. See p. 18, current volume, SCIENTIFIC AMERICAN.

(3) S. W. O. asks (1) if there is anything better than camphor for preserving insects, butterflies, and moths. I have been using camphor for three years, and it is collecting on the insects so fast that in another three years they will be white with it. A. See p. 11 (40), Vol. 38, SCIENTIFIC AMERICAN. 2. The brass part of my microscope has become rusty; how can I get it off? A. Remove the lacquer with caustic soda, clean with emery flour, and relacquer. 3. What is the best cement for mending a large china fruit bowl which is broken across the middle? A. Use one of the receipts given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(4) G. C. R. writes: I desire to cement in a brass frame a glass tube through which kerosene oil flows. Can you inform me of a cement which can be used for the purpose, which is impervious to the oil, and which is not affected by it? A. Borax, 1 part; shellac, 4 parts; boiling water, sufficient to form a thin paste. Thicken with whiting and use hot. A small quantity of glue is sometimes added.

(5) C. M. D. asks (1) for a method of separating the copper from the settlings of a gravity battery, I wish to obtain the copper pure. A. Wash the copper in hot water and fuse it in a blacklead crucible. 2. Please give directions for making an electric light suitable to light a room 12x15, and the best battery for the purpose and number of cells needed. A. Use a battery of 30 bichromate cells. There are a number of suitable regulator lamps in the market.

(6) J. H. M. asks (1) how washing bluing (powdered) is prepared. A. There are several wash blues in the market: soluble Prussian blue, aniline blue, ultramarine, and neutralized sulphindigotic acid. See p. 969, No. 61, SCIENTIFIC AMERICAN SUPPLEMENT. 2. How is stove polish made in cakes? A. The best stove blacking consists of pure graphite or plumbago, reduced to a fine powder and rendered cohesive by strong pressure while moist.

(7) J. H. H. asks (1) whether a Holtz electric machine can be used instead of the induction coil in repeating the experiments of Professor Crookes given in SUPPLEMENT No. 189 A. Yes, but the electric discharges are less frequent and less controllable than where the induction coil is used. 2. How large a coil will be necessary for the experiments on a small scale; that is, not before an audience, but in a laboratory? A. A coil that yields from 1 to 1½ inch spark. 3. Is the Sprengel pump figured in Ganot's Physics, eighth English edition, capable of forming a vacuum of the exhaustion required, or are there better methods of creating a vacuum? A. The Sprengel pump, or some modification of it, will produce as perfect a vacuum as can be made.

(8) K. P. M. writes: I have a well and spring water, and analyzed them according to instructions from SCIENTIFIC AMERICAN, and found in the well water a strong trace of chloride of sodium, in fact it turned milky, and it lost its color under permanganate test. The spring water has no trace of chlorides; it keeps its color under permanganate test, but there is considerable sediment in the bottom. Now, is the spring water fit to use? A. Probably, but we cannot judge fairly from your statements.

(9) W. F. J. asks what is applejack, and how is it made. A. A high spirit made chiefly from cider by distillation. A brandy made from apples.

(10) F. F. S. asks how to remove plaster stains from a cherry and maplewood floor. The floor was covered with dry sand, but the mortar from plaster dropped on it struck through. A. Try rubbing the spot with a little dilute hydrochloric acid. Dry thoroughly and oil.

(11) G. W. M. writes: 1. I notice that some of the leather I have used for valves and plungers for wooden pumps, in a year or two grows hard and stiff. What kind of leather should I use that will remain soft and pliable? A. Leather thoroughly saturated with lard oil will retain its flexibility indefinitely under the circumstances. 2. Is there anything not poisonous with which tin pipe may be coated inside that will prevent its rusting for six or eight years? Would soluble glass auswer the purpose? A. Try a platinum varnish. Soluble glass will not answer.

(12) C. M. asks how the beautiful blue black color on the guards and heelplates of some guns, particularly those of Colt and Parker, is obtained. We have tried pulverized charcoal and heated sand, but the color is either blue with a reddish cast or a light green. Can it not be done with sulphur somehow? A. It is done by first heating the articles until they become blue and then gray, and then allowing them to cool; they are afterward heated until they again become blue.

(13) T. McD. asks if copper wire (for an induction coil) can be insulated as perfectly by long strips of silk as by the usual way, the silk to be about ½ inch wide and any number of feet long, and to be put on lengthways of course. A. This method of insulation is not practicable, as the ribbon would take a great deal of room and would be troublesome to apply. Better make an apparatus like that shown on p. 124, current volume of SCIENTIFIC AMERICAN, and cover your wire with thread.

(14) S. A. B. writes: 1. Of two similar iron vessels of same capacity, one containing compressed air to 300 lb. per square inch, and the second acting as boiler and generating steam to 75 lb. per square inch, which will explode with the most violent and disastrous results, and under what conditions? Which is the safer? A. Compressed air is safer; it does not scald. When a steam boiler explodes a portion of the water expands into steam, thereby greatly increasing the volume of steam. This accounts for the powerful effects of boiler explosions 2. How long will the vessel containing compressed air (say capacity=3 cubic feet) supply 20 cubic inches of air at a uniform pressure of 50 lb. per square inch? A We cannot answer this without knowing pressure of the compressed air. 3. What is the capacity and what pressure do compressed air vessels usually carry? A. Pressure 200 to 400 lb., capacity to suit purpose. 4. At what point in the cylinder will the piston be when engine is at half stroke, that is, crank at right angle with piston rod? A. Depends upon length of connecting rod.

(15) J. S. asks: What is the best way to kill insects, for collections, so that their legs will not contract? A. Dip them in turpentiue or chloroform.

(16) H. B. writes: In your issue of 12th instant, page 24, 7th paragraph, speaking of the fossil bones of the moa Mr. Haas says: "The massive limbs, larger than those of the heaviest ox, had evidently been broken to extract the marrow." Query: Do birds have marrow in their bones? A. Some of the bones of birds have large marrowless spaces.

(17) G. L. asks how to make sand paper. A. Crush glass under a runner and sift it into about six sizes. Coat a good quality of manila paper with thin glue and dust the pulverized glass over it. Sometimes two coats of glue and glass are thus applied to the paper.

(18) J. S. B. asks (1) how to find out the quantity of water a pump will furnish, at 40 strokes per minute, in one hour, each stroke 0·22 gallon per stroke. A. 40 strokes per minute is 2,400 per hour, and 22 one hundredths of a gallon per stroke, 2,400x0·22=528 gallons per hour. 2. I copy the 0·22 gallons per stroke from the circular advertising the pump. Does it signify 22-100 of a gallon? A. 0·22 gallon = 22-100 of a gallon.

(19) D. W. M. asks how to arrange an electric bell with a telegraph circuit so that when the circuit is broken it will close a local battery and ring the bell. A. Arrange a relay so that when the armature falls away from the magnet it will close the local circuit.

(20) A. B. P. asks (1) how a current of electricity is generated in the wire around a permanent magnet in the Bell telephone? A. The vibrations of the diaphragm in front of the magnet disturbs the normal condition of the magnet; any change of magnetism in this generates electrical currents in the surrounding helix. 2. Does the wire touch the magnet or membrane? A. No. 3. Is it necessary that the membrane be metal: would it not be better to make it out of thin sheet rubber, with a piece of metal glued to it in the center? A. It should be soft iron. 4. Does it weaken a permanent magnet to revolve an armature close to it? A. No. 5. Can I change the pole of the electro-magnet so that it will attract and then repel? I want to make an electric engine. A. Yes.

(21) C. A. P. writes: 1. We have put up a siphon in our mines to take out the water according to description on page 315, No. 20, Vol. 36 (25), SCIENTIFIC AMERICAN. The length of it is nearly 1,000 feet; about 800 feet runs through a tunnel on a grade of 6 inches to the 100 feet. Diameter of pipe 1½ inch. We have three pet cocks tapped in the pipe at intervals of 150 feet in the tunnel to let out the air when we prime it. We have also an automatic air valve on the apex and a check valve in the suction end. After we started it, it would run a full stream for a short time, then diminish gradually until it stopped altogether. We tried it several times with no better result. We then fastened a piece of an inch pipe on the discharge end and let it project through the side of a barrel sunk in the ground, so that there is 6 inches of water over the mouth of the pipe. It is running in a continual stream since we made the change, but it will not keep the water low enough in the mines at this rate. How can we remedy it? A. We infer from your description that the head upon the discharge opening or end is so great that, with the length of pipe and friction, the water cannot be supplied fast enough to keep your discharge opening full, probably if you use a 2 inch pipe and put to it a 1½ in. discharge nozzle you will accomplish your object. 2. The pipe runs from the mouth of the tunnel down a slope on a grade of about 30 degrees; at the bottom the pipe discharges horizontally. Will it work any better by running the pipe on a trestle the same grade as in tunnel, that is, 6 inches to 100 feet, until it will be over the present discharging point, then run the pipe down near the ground so the discharge end will be perpendicular? A. We do not think this proposed change will benefit your present arrangement.

(22) C. T. M. writes: Some time ago, Vol. 37 p. 123 (17), you described a method of making vinegar. Will you please answer the following questions in the SCIENTIFIC AMERICAN? 1. If I use a vinegar barrel as a generator, how far apart should the holes in which the pack thread is inserted be? A. From 2 to 3 inches 2. How many and what size glass air vents should be placed in the shelf? A. Use 8 ¼-inch tubes. 3. What sized air holes should those near the bottom be? A. From ½ to 1 inch. 4. How much of each of alcohol, water, and honey, are used for the mixture? A. 1 part 80 per cent alcohol, 4 to 6 parts of water, and 1-1000 of honey. 5. Please give a recipe for making a self shining liquid shoe polish? A. Soft water, 1 gallon; extract of logwood, 6 oz.; dissolve by aid of heat. Soft water, 1 gallon; borax, 6 oz.; shellac, 1½ oz.; boil, stir, and add bichromate of potash, ⅜ oz., dissolved in ½ pint of water. Mix all together, warm, and add ammonia water, 3 oz. 6. Please give directions for making a galvanic battery, with directions for plating insects, etc., with gold, silver, etc. A. See p. 91 (10), Vol. 41, and pp. 47, 248, 341, and 380 (39), Vol. 35, SCIENTIFIC AMERICAN.

(23) J. A. C. asks (1) what will remove coal oil from a wool carpet without taking up the carpet. A. Moisten the spot with benzole, cover it with a piece of dry flannel, and pass a hot iron over it. Repeat with clean flannel if necessary. 2. How can I calculate the horse power of a stream, the cross section of stream and velocity being given, also head? Please state rule plainly as possible. A It will depend upon the quantity of water you deliver at the outlet, and as this will determine the amount of head lost by friction, it becomes an important element in determining the available power. If there is no waste at the outlet, the head there would be equal to 22 feet, but it is evident that the more rapidly the water is drawn at the outlets, the greater must be the difference of head there and at the source, to overcome the friction through the pipe.

(24) J. H. M. asks if there can be made a steel blade or chisel one eighth of an inch thick driven by a wheel and crank which will penetrate a bar of iron without breaking. A. If we understand your query, yes; a power punch is an example.

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(25) J. C. asks: What is the amount of horse power claimed for the steamer Great Eastern? A. 3,800 horse power nominal.

(26) C. C. D. asks: 1. Can you tell me how to bend spring steel wire 17 size? I find in trying to bend the same that it most always breaks,and cannot get it in the proper shape that I wish. A. If you use a good quality of wire there will be no difficulty in coiling it. Piano wire makes an excellent spring and requires no tempering. 2. After the temper has been taken out how can I retemper it to its former stiffness? A. Springs made of ordinary steel wire are hardened by heating them to a cherry red and plunging them into cold oil. They are tempered by heating them in a flame until the oil blazes. They should be turned constantly to insure an even temper throughout. In some cases it is necessary to "blaze them off" more than once. 3. How to nickel plate the same: will a battery be required? A. See p. 209, Vol. 38, SCIENTIFIC AMERICAN.

(27) H. B. asks (1) how to make a solution for battery of 1 zinc plate 3x4 inches, and 2 carbon plates 3x4½ inches. A. Dissolve two parts of bichromate of potash in twenty parts of warm water. When cool add one part of sulphuric acid. 2. How far apart should the plates be? A. About ⅜ inch.

(28) J. C. H. asks how precipitated chalk is made to adhere to form balls such as druggists keep for sale, for the face. A. By subjecting it to heavy pressure while slightly moist.

(29) J C. writes: In your issue of July 26, page 59, question 26, J. D. asks: [See his question and your answer]: Assuming 306 cubic feet to be discharged under 3½ foot head, and 347 feet with same apertures under 4½ foot head, flowing on a 13½ foot overshot wheel in both cases, you state the power of the wheel will be 11·8 and 13 4 horse power respectively; if I read the questions and answers correctly is this so? I make it $\frac{306\times62\cdot5\times13\cdot5}{33000}=7\cdot82\times\cdot75=5\cdot76+$ actual H. P. and $\frac{347\times62\cdot5\times13\cdot5}{33000}=8\cdot87\times\cdot75=6\cdot65+$ " "

Assuming the duty of the wheel to be 75 per cent the value of the water. A. You are right. The error, whatever it was, evidently affected proportionately both calculations. 2. Is 306 and 347 horse power the actual discharge under the above conditions (aperture 1½ by 48 inch)? A. Very nearly; in practice probably 5 per cent should be deducted on account of form of opening and friction. 3. What is the best recorded duty of overshot wheels? A. Bresse records 80 per cent, Daubisson, very large wheels, 83 per cent, and Morin claims to have obtained experimentally 90 per cent. 4. What is the average duty of engines and boilers per pound of coal per horse power per hour, in New England woolen and cotton mills,after being in use from 6 to 10 years—approximately? A. We are not aware of any experiments to determine the duty of the class of engines you mention. 5. What is the best coating for a turbine wheel when the water has the effect to rust it and form tubercles on the buckets? A. We think if well painted with brown oxide, ground in pure linseed oil, it would be well protected.

(30) "Operator" asks: 1. How can I make a small, cheap furnace to melt brass, zinc, etc., say from an ounce to one half pound, and what fuel should be used to get heat enough? A. A common cylindrical coal stove connected with a chimney having a good draught, may be used for this purpose. Use anthracite coal for fuel. 2. Can a person make an article (patented) for his own use without infringing; for instance if I should make a pair of Bell telephones for my use, would it be infringing? A. See Rights of Investigators, p. 128, Vol. 39, of SCIENTIFIC AMERICAN.

(31) R. B. N. writes: I have a set of German silver drawing instruments, but from bad management the steel has rusted and the silver dulled; will you please inform me through your "Notes and Queries" how I can make both bright again? A. The only remedy is to repolish by means of emery and crocus wheels or by hand, using fine emery paper and finishing with crocus cloth

(32) F. G. will probably find the following tonic for the hair as good as any he can use: Take one ounce of sage and steep it in boiling water for ten minutes; strain and add two ounces of glycerine, one quarter ounce of powdered borax, one quarter ounce of lac sulphur, one quarter ounce of tincture of cantharides, bergamot sufficient to perfume. Apply twice a week with the hand, and rub thoroughly in. It will remove dandruff and strengthen the growth. It will also, it is said, prevent gray hairs.

(33) C. S. Y. writes: 1. I wish to make a battery like one described on page 91, current volume of SCIENTIFIC AMERICAN. How is the battery fluid made? A. Dissolve two ounces bichromate of potash in one pint of warm water. When cold, add slowly two ounces sulphuric acid. 2. How can I fasten a wire to the flat surface of the carbon so as not to be eaten off by the acid? A. Drill a small hole in the carbon, taper the end of the wire, and twist it tightly into the hole. Heat the carbon plate so that it will just melt paraffine, and apply a little paraffine to the carbon around the wire. After it has soaked through, allow it to cool, and place a drop of melted paraffine over the lower end of the wire. Care must be taken to avoid saturating too much of the carbon with paraffine, as this renders the carbon useless. 3. How is a Bunsen battery made? A. For full instructions for making batteries of various kinds see SUPPLEMENTS 157, 158, and 159. 4. What is the name of the metal I inclose, and what is it used for? I have a piece the size of a chestnut It was found in Peru about 22 years ago. A. It is an amalgam of silver and mercury, containing also lead, antimony, copper, and a trace of gold—probably not of natural occurrence.

(34) Q. E. D. asks: 1. Please to tell me how I can make a common electric call bell ring when the circuit is open. I want to connect it with a door, so that when the door is opened the bell will ring. A. A single stroke bell may be made to strike on opening the circuit by employing the magnet to hold the hammer away from the bell, and providing a spring, or its equivalent, to carry the hammer against the bell when released by the magnet. You might operate a vibrating bell by employing a local battery and a relay; but an open circuit battery like the Leclanche or the Fuller would be far better. If such were used, you would need to arrange your door fixtures so that the circuit would be closed on opening the door. 2. How many feet of outdoor wire are there in a pound? A. There are about 22 feet of No. 10 iron wire in a pound. 3. Do old battery zincs that have not been used for some time have to be amalgamated again before they will work? A. If the zincs have not a coating of mercury they should, of course, be re-amalgamated.

(35) C. E. G. asks the proportion of magnesia, zinc, etc., for making imitation meerschaum, and how it is prepared. A. To a hot concentrated sirupy solution of zinc chloride add powdered magnesia to form a thick paste, which should be moulded into form as quickly as possible, and after baking at as high a heat as it will permit without injury, cover it with powdered caustic lime and let it cool slowly.

(36) O. D. writes: 1. I have often seen sumac quoted in the New York market. Is it the kind that grows native in central New York; if so, what portion is used and how is it prepared for shipping? A. Yes; see p. 199, vol. 36, and 204 (67), vol. 37, SCIENTIFIC AMERICAN. 2. What kind of a crucible is required for fusing iron, and where are they to be found? A. Use a blacklead (graphite) crucible. See "Business and Personal" column. 3. I see no advertisement in your columns of minerals. Where can tungsten, silver, nickel, etc., be purchased? A. Any metallurgist or chemist can obtain them for you.

(37) E. I. B. asks for the name of some good book on the assaying of gold and silver ores. Something that is not too expensive and that is practical. A. Consult Rickett's "Notes on Assaying."

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

S.L.—Marcasite—sulphide of iron.—H.M.H.—Sample appears to contain a gold telluride, but the amount available was too small for confirmatory tests.—M. B.—The ore is an argentiferous (silver bearing) galena—lead sulphide. If the sample is a fair representative of the ore body the property is valuable. A series of assays would determine its actual richness.—F. B. F.—It is an impure ferruginous clay or ocher containing a sufficient quantity of iron oxide to, if properly washed and roasted, be used as the basis of a cheap paint for iron work, etc. —M. E. S.—The ore contains nearly 20 p. c. of copper. The value of the property will depend somewhat upon its location.—M. Bros.—The rocks contain shell lime stone and a semi-decomposed feldspathic. The former, if properly kilned, will make a good agricultural lime, and the latter may also be used with advantage as a dressing for some crops.—Correspondents who sent supposed tin ore and antimony please send address.

COMMUNICATIONS RECEIVED.

On Many Ported Slide Valve. By F. G. N.
On the New Optical Delusion. By P. J., W. G. S.
List of Exports from Augsburg to the United States. M. O.
On Compressed Air Theory. M. R. C.
On Local Government. R. P. P.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

August 12, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Adjustable roller and stalk cutter, W. H. Bowles. 218,423
Advertising umbrella, A. J. Gruyer 218,382
Aerial ship, W. F. Quinby..... 218,573
Animal trap, W. C. Hooker..... 218,532
Atmosphere moistener, J. G. Garland (r)..... 8,847
Axle, carriage, H. Killam 218,443
Baking pan, Wassner & Yoe 218,411
Balance wheel, J. V. Morton 218,555
Bale tie, cotton, T. J. Torrans 218,600
Baling press, M. C. Hall 218,525
Bed clothing, O. S. Baker 218,420
Bird and similar cages, B. A. Drayton 218,505
Bit stock, O. W. Stow 218,593
Bobbin, W. T. Carroll 218,428
Bolting screens, clearing the meshes of, Holcomb & Heine..... 218,530
Bracket, M. J. Burkarth..... 218,365
Brick kiln, T. S. Hawkins..... 218,529
Bricks, manufacture of white or light colored, T. C. Clark (r)..... 8,843
Broiler, C. F. Henis..... 218,440
Brush, A. L. Sonn..... 218,587
Brush, scouring and scrubbing, J. S. Dunham 218,431
Buckle, W. J. Carnes, Jr..... 218,486
Butter package, A. White 218,609
Button hook, G. L. Platt 218,570
Can guard or jacket, Perkins & Browne..... 218,398
Capstan, power, T. W. Hyde (r)..... 8,842
Car coupling, E. R. Hollenbeck..... 218,531
Car coupling, S. J. Keim (r)..... 8,848
Car coupling, E. M. Williams 218,466
Car, iron railway, T. E. Allison..... 218,361
Car, steam street, J. Aspey 218,467
Car wheel, J. Rigby..... 218,453
Car wheel, J. Taylor..... 218,409
Carpet stretcher, J. S. Hendrickson..... 218,439
Carriage spring, D. S. Bailey..... 218,419
Caster, furniture, O. Pederson..... 218,565
Cattle, horn tip for, G. W. Carroll..... 218,484
Centrifugal machine, S. S. Hepworth 218,441
Chain, ornamental, J. P. Carpenter..... 218,485
Check, lunch and baggage, H. M. Richards 218,577
Cheese cutter, Blodgett & Felix..... 218,477, 218,478
Churn, W M. Myers..... 218,557
Churn, power, A. Miers 218,553
Clock, J. Dittmeier 218,368
Coffee pot, C. & W. Kirkpatrick..... 218,384
Collar, A. U Waterman..... 218,606
Commode, J. W. Sprint 218,589
Cooker and drier, steam feed, T. E. Daniels .. 218,497
Cop tube, A. Ball 218,471
Copies of writings, producing, E. Du Zuccato (r).. 8,853
Corset steel, P. Laflin..... 218,386
Cotton chopper, R. E. Lee 218,387
Coupling device for lines, etc., B. Bird..... 218,363
Cultivator, J. L. Buskett..... 218,482
Cultivator, C. Hardgrave 218,526, 218,527
Cultivator, O. Olson..... 218,561
Cultivator, R. B. Robbins..... 218,454
Cultivator, C. Stephens 218,407
Curd cutter, H. H. Potter..... 218,450
Damper, automatic, H. W. Taber..... 218,596
Dishes and table cutlery, apparatus for washing, E. P. Walling..... 218,410
Draught equalizer, A. J. F. Ehrich 218,370
Dredging machine shovel, J. Canan..... 218,427
Drying house, J. Kennedy 218,536
Drying house, fruit, S. W. Craven..... 218,495
Egg crate, J. L. Stevens..... 218,592
Egg tester, J. G. Halsey..... 218,435
Electricity, reproducing objects by, R. Barrie..... 218,473
Elevator gate, automatic, J. F. Newhall 218,395
Fare register, J. B. Benton 218,421
Feed water heater and condenser for steam boilers, R. Llewellyn..... 218,446
Fence, barbed, G. M. Fish..... 218,373
Fence wire, barbed, J. A. Duncan 218 506
File, newspaper, J. J. Christie..... 218,488
Filter, water, I. Brach..... 218,424
Finger nail cutter, A. McDonald..... 218,391
Firearm, magazine, W. H. Elliot..... 218,371
Fire extinguisher, C. L. Delmage (r)..... 8,841
Fire extinguisher, automatic, H. S. Parmelee..... 218,564
Fire extinguisher automatic valve, F. Grinnell... 218,524
Fires on shipboard, etc., apparatus for extinguishing, J. H. & T. E. Connelly 218,491
Flue boilers, cleaner for vertical, C. M. Miller. ... 218,392
Flue boilers, thimble for vertical, C. M. Miller.... 218,393
Fluid propeller or motor, J. B. Vliet..... 218605
Folding chair, J. Weber, Jr..... 218,607
Fountain, F. C. Boswel..... 218,422
Furnaces, construction of domes or crowns of gas and other, W. Smith..... 218,584
Furnaces used in the manufacture of iron and steel, lining of cupola, reverberatory, Bessemer, and other, G. J. Snelus..... 218,405
Garment stiffener, A. M. Day 218,430
Gas maker, W. Smith 218,585
Gas, scrubber or purifier for illuminating, A. W. Wilkinson..... 218,611
Gas washing machinery, T. K. Lees (r)..... 8,851
Gate, J Malone..... 218,390
Gate, W. N. Fort..... 218,513
Governor and self-adjusting cut-off, C. B. Cook... 218,492
Grain binder, S. D. Locke..... 218,447
Grain drill, F. M Steves..... 218,461
Grain drill shoe, J. T. West..... 218,412
Grain elevator, pneumatic, J. B. Stoner... 218,595
Grain for after milling, preparing, S. Potts..... 218,571
Grain meter, J. B. Stoner 218,594
Grain separator, L. W. Hasselman 218,437
Grapes, restoring moisture to, C. J. Renz 218,401
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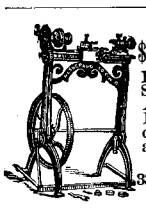

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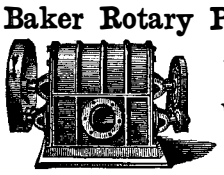

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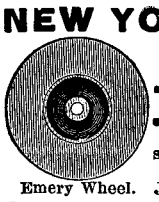

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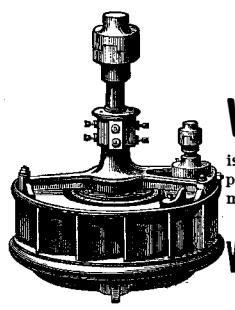

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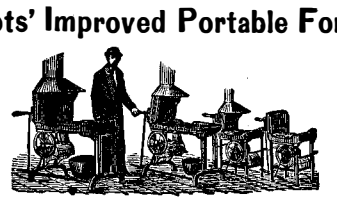

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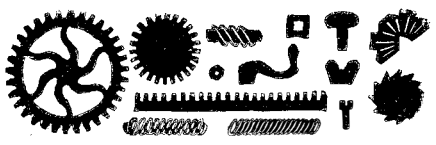

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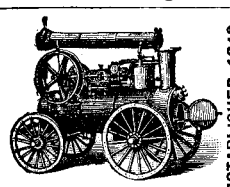

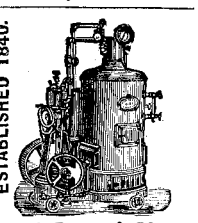

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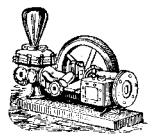

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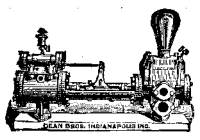

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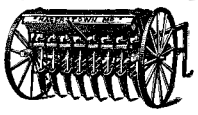

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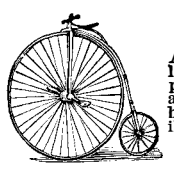

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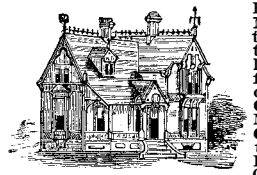

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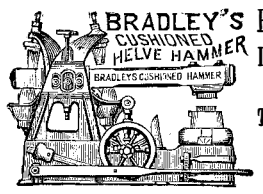

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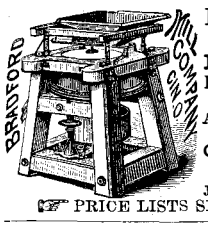

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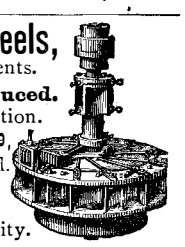

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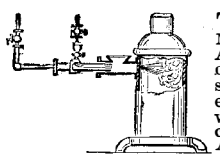

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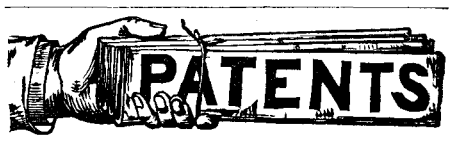

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